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RECORDS

OF THE

BOTANICAL SURVEY OF INDIA.

VOLUME IV.—NOS. 1—3.

AN EPITOME OF THE BRITISH INDIAN SPECIES OF IMPATIENS.

BY

SIR J. D. HOOKER, G.C.S.I., C.B., F.R.S.

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AN EPITOME OF THE BRITISH INDIAN SPECIES OF *IMPATIENS.*

By J. D. Hooker.

INTRODUCTION.

The following classified list of Indian Balsams, followed by some synonymy and habitats, is offered to the "Records of the Botanical Survey of India" in the hope that it may induce the resident botanists and forest officers of that country to take up the collecting, if not the study, of this, which is the second largest genus * of Indian flowering plants and that which has hitherto been the most neglected by collectors.

The classification of species here attempted is a wide departure from that adopted in the *Flora of British India.* For this there are two principal reasons,—firstly, the number of new species discovered since the publication (in 1874) of that work † and the communication of better materials of others has demanded a re-examination of the old sections, resulting in the revision of some, the abandonment of others, and the construction of additional ones. Secondly, the restriction of the vast majority of the species of *Impatiens* each to its own region of distribution, (Eastern Himalayan, Western Himalayan, Burmese, Malabarian, Ceylonese and Malayan Peninsular) and the great difference between the species of any two of these regions, necessitates the adoption to a great extent of different sections in each area.

---

* In number of Indian species (about 200) *Impatiens* is exceeded by *dendrobium* alone. It abounds most in countries a very few places in which have been explored; as the Eastern Himalaya, for about 300 miles of which the small district of Sikkim alone has been explored, yielding upward of 60 species; Nepal, 500 miles long, from which about 15 species, from the Khatmandu Valley, were brought by Wallich in 1822; and Burma, which is said to swarm with species in its hilly districts, but has as yet yielded only 52, which is however double the number from that country recorded in the *Flora of British India.*

† The number of species described in the *Flora of British India* (1874) is only 124, whereas now, in 1894, about 200 are known, together with a large contingent of indeterminables. During the same interval the Western Himalayan species have risen from 15 to 24; the Eastern Himalayan from 25 to 63; and the Burmese from 22 to 52 (all above numbers approximate only).

As evidence of this segregation (which has no parallel in the Indian Flora) it is sufficient to point out that only about 8 species are common to the Himalaya east and west of Nepal respectively; that of upwards of 100 species, only 7 are common to the East Himalaya and Burma, that of nearly 60 Malabar species only 2 are found in the Himalaya or Burma; and what is most remarkable is, that of the two primary sections or series under which all the Indian species are ranged, namely A, species with a short capsule turgid in the middle, and B, species with a slender linear or clavate capsule, only one species of A is found in the Western Himalaya, and not a single species of B in Malabar, Ceylon or the Malay Peninsula; in the Eastern Himalaya and Burma, both A and B are represented. I shall therefore in this communication treat the species primarily phytogeographically.

The points upon which most information, as not being obtainable from Herbarium specimens of *Impatiens*, is wanted, are the duration and habit of the species, annual, biennial or perennial, the number and position of the stipular glands, the presence or absence of raphides in the leaves and floral organs. The colours of the flowers, with drawings if procurable, the nature and function of a dilatation on the opposing margins of the wings which occurs nearly opposite the sinus between the lobes of the wings; this, which is often absent, may be produced into an ear-shaped lobule or into a thread descending into the spur; I have called it the dorsal auricle of the wings. The anther varies greatly in the genus and can rarely be described from Herbarium specimens. The fruits and seeds of many species are unknown, and, owing to the testa of the latter shrinking in drying, these should be described from fresh specimens. Pollination by insects is a very interesting process, which should be watched and described.

In forming Herbarium specimens these should be laid in the sheets of a portfolio in the field, with spare flowers and with separate floral organs laid beside them. It is not recommended to preserve flowers in alcohol, which renders them very brittle.

The flowers of *Impatiens* are so anomalous in structure that it may be useful to inform beginners of the real nature of their parts, and of the terms which, for the sake of brevity, I have adopted in describing them. There are 3 or 5 *sepals*, usually 3 only, of which 2 are lateral, one on each side of the flower, they are often very small and green, but sometimes coloured ; the third, the *lip*, is always coloured, is very much the largest, almost uniformly saccate or funnel-shaped and spurred ; when there are 5 sepals the 2 additional, always small and often slender, are inserted within and above the two lateral. There are 5 petals, 4 confluent in pairs, the *wings ;* the fifth petal, the *standard*, is usually more or less orbicular and often spurred at the back. Viewing the flower in front, the standard is at the back of the flower, the lip in front, the wings appear to come out of the lip and the two or four lateral sepals are more or less out of sight The term *standard* is adopted from that of the pea-flower, the dorsal petal of which it resembles or represents, as the *wings* do the lateral wing-petals of the same plants ; the term *lip* is taken from its resemblance in position, and more or less in form and function, to that organ as it occurs amongst Orchids. I need not remind botanists that the flower of an *Impatiens*, as seen in front, is really upside-down (resupinate); in early bud the position of the parts is reversed.

◆

I.—Species of the Western Himalaya from the Nepal Frontier to Chitral.

The chief materials from which the following list is drawn up were procured by Dr. Royle, Lady Dalhousie, Captain Strachey and Mr. Winterbottom, Dr. Thomson, Mr. M. P. Edgeworth, Dr. Fleming, Mr. C. B. Clarke, and Mr. J. F. Duthie. To the latter botanist I am especially indebted for having despatched from the Botanical Department, Saharanpore, a very able collector, Mr. Inayat, into Kumaon, Kashmir and Hazara to collect and preserve specimen of Balsams with dissevered floral organs, as well as leaves and inflorescences and fruit. The results have been of very great service.

In the following key I have introduced a section that does not appear in the *Flora of British India ;* it is section 5, distinguished by the position of the bracts on the raceme. It will reappear in the keys of the East Himalayan and Burmese species. The European and North American species of *Impatiens* belong to it, as do many Chinese.

The salient character of the East Himalayan group of species is that series A is represented by a single one only, *I. Balsamina* L., which is the only one common to 6 Indian regions of the genus. It is represented by 39 species in Burma, by 10 in the East Himalaya; and all those of Malabar, Ceylon and the Malayan Archipelago belong to it. Of the Western Himalayan species the most notable is *I. tingens* Edgew., the dorsal auricle of the wings of which is produced into a slender thread descending deep into the spur of the lip. The same structure appears in a few other in no way related Indian species. Its function is no doubt related to fertilization by insects, and should be studied in the living plant. *I. amplexicaulis* Edgew., is remarkable in its foliage; *I. Edgeworthii* Hk, f. is the only species of the genus in India with a remarkably protruded basal lobe of the wings. *I. glauca* H. f. & T., is the only Indian species that approaches the European *I. Nolitangere* L., which extends over North Asia into China. This it does in habit, in the broad shallow crenation of the leaf, in the inflorescence, and in the disposition of the bracts.

Key to the species.

SERIES A.—Capsule short, turgid in the middle, contracted at both ends.—Of this series there are many species in Sikkim and Burma, and all those of Malabar, Ceylon, and the Malay Peninsula belong to it.

§ 1. *Inflorescence of solitary or fascicled pedicelled flowers in the axils of the leaves; pedicels rarely fascicled on a very short peduncle, minutely bracteate at the base.*—There are many species of this section in all the other Indian regions of the genus.

Leaves alternate lanceolate serrate,
capsule oblong tomentose . . 1. *I. Balsamina* L.

SERIES B.—Capsule elongate, linear or clavate.—Of this series there are no species in Malabar, Ceylon or the Malay Peninsula, but many in the Eastern Himalaya and Burma.

I. Pedicels bracteate at the base only; (never on the pedicel above the base) or ebracteate.

§ 2. *Inflorescence of many long-peduncled erect subcorymbosely disposed racemes from the axils of the upper often crowded leaves, usually many-flowered; pedicels often panicled or whorled; flowers large or medium-sized.*—In small specimens the inflorescence is reduced to a single peduncled few-flowered raceme. After flowering the rachis of the raceme often elongates between the flowers.

* Wings 2-lobed, basal lobe not produced in front into a decurved lobule :—

† Basal lobe of wings acute, upper margin cuspidate or spurred, capsules deflexed :—

Lip saccate:—

Leaves serrate, capsule broadly clavate . . . . . 2. *I. Roylei* Wall.

Leaves crenate, capsule elongate narrowly clavate . . . 3. *I. sulcata* Wall.

Lip infundibular or subsaccate :—

Leaves petioled, bracts very slender . . . . 4. *I. Thomsoni* Hk. f.

Leaves sessile amplexicaul, bracts lanceolate . . . . 5. *I. amplexicaulis* Edgew.

†† Basal lobe of wings rounded, the upper margin not spurred or cuspidate :—

Leaves crenate crenulate or crenate-serrate :—

Capsules erect, racemes elongate many-flowered interrupted :—

Bracts and sepals with long gland-tipped awns . 6. *I. bicornuta* Wall.

Bracts and sepals broadly ovate . . . 7. *I. bicolor* Royle.

Capsules deflexed, racemes short or umbelliform few-flowered :—

Leaves ovate, bracts ovate or cordate :—

Lip infundibular, narrowed into the spur . . 8. *I. Lemanni* Hk. f.

Lip cymbiform, spur 0. . 9. *I. violoides* Edgew.

Leaves lanceolate, bracts very slender . . 10. *I. Aitchisoni* Hk. f.

Leaves serrate or serrulate, capsules erect :—

Lip with spur 1-1½ in., capsule 1-1⅓ in. . . . . 11. *I. Balfourii* Hk. f.

Lip with spur ½ ⅔ in., capsule ½ in. . . . . . 12. *I. Flemingii* Hk. f.

** Basal lobe of wing produced upwards anteriorly into a decurved lobule, flowers golden yellow, capsules erect :—

Sepals ⅓ in., midrib thick . 13. *I. Edgeworthii* Hk. f.

§ 3 *Inflorescence of § 2, but pedicels very rarely fascicled or whorled and flowers small, sometimes minute. Capsules erect, except in* I. laxiflora.—There are many species of this section in the Eastern Himalaya and Burma, but none in Malabar, Ceylon or the Malay Peninsula.

Leaves crenate or crenate-serrate, or serrulate in *I. brachycentra*:—

Dorsal auricle of wings filiform descending into the spur, flowers white or pink . . . . 14. *I. tingens* Edgew.

Dorsal auricle of wings very short or 0:—

Flowers yellow, bracts very slender, sepals uniglandular on one margin, spur long short or 0 . 15. *I. racemosa* DC.

Flowers white and rose, bracts ovate, spur long . . . 16. *I. laxiflora* Edgew.

Flower very minute white, spur 0 or very short . . . . 17. *I. brachycentra* K. & K.

Leaves serrate or serrulate: see also *I. brachycentra*:—

Flowers pink or white, bracts ovate . . . . . 18. *I. parviflora* DC.

§ 4 *Inflorescence a very long-peduncled axillary spreading few-flowered raceme; pedicels sub-equidistant, bracteate at the base, bracts and sepals various; flowers large.*—There are many species of this section in the East Himalaya and Burma, but none in Malabar, Ceylon or the Malay Peninsula.

Lip saccate with a stout short incurved spur, bracts large . . . 19. *I. Inayatii* Hk. f.

II. § 5. *Inflorescence lateral, of solitary axillary short simple or forked 1-5-flowered peduncles; branches (pedicels) bracteate above the middle, rarely at the fork, or ebracteate sometimes beneath the flower; flowers small or medium-sized; capsules usually long slender terete decurved or pendulous.*—In the irregular forking or branching of the peduncle and disposition of the bracts, this section differs from all others. When the peduncle is 1-flowered, a minute bract often occurs at the middle. There are species of this section in the Eastern Himalaya and Burma, but none in Malabar, Ceylon or the Malay Peninsula.

Lip spurred, bracts narrow :—
Sepals orbicular, lip more or less saccate, spur ½ in. . . . 20. *I. cristata* Wall.
Sepals ovate, lip infundibular, spur ½-1½ in. . . . . . 21. *I. scabrida* DC.
Lip spurred, bracts ovate, stem and leaves glaucous . . . . 22. *I. glauca* Hk. f. T.

Lip spurless :—
Leaves 2-3 in., deeply serrate or toothed . . . . 23. *I. serrata* Benth.
Leaves 1-1½ in., serrulate . . 24. *I. serrulata* Hk. f.

OBSERVATIONS AND LOCALITIES.

§ 1.

1. **I. Balsamina,** *Linn.: Fl. Brit. Ind.* i. 453.

Tropical Himalaya, alt. 1-5,000 ft., from Kumaon to Marri.—Also in Southern and Eastern India. Besides the garden form with large double flowers, three with marked characters occur in the Western Himalaya; they will be found to be united by intermediates.

1. Basal lobe of wings short, as broad as long, cuneiform with rounded angles, spur ¾ in. long.—Murree.
2. Basal lobe of wings as broad as long, abruptly narrowed into a short stipes, spur very short. I. rosea, *Lindl*
3. Basal lobe of wings longer than broad, narrowed into a broad stipes, spur ½-¾ in. long.

§ 2.

2. **I. Roylei,** *Walp.: Fl. Brit. Ind.* i. 468. I. sulcata, *Wall. Cat.* 4,764 *in part.* I. glanduligera, I. candida *and* I. macrochila, *Lindl.* I. glandulifera, *Royle.* I. moschata, *Edgew.*

Kumaon to Kashmir and Hazara, alt. 4,000-11,000 ft.—Extends eastwards to Central Nepal?

3. **I. sulcata,** *Wall.: Fl. Brit. Ind.* i. 469.

Kumaon to Chamba, alt. 9,000-14,000 ft.—Extends eastwards to Sikkim.

VAR. **minor,** *Fl. Brit. Ind.* l. c.

Smaller in all its parts, leaves 2-3 in. long, lip more infundibular, capsule ¾ in.

Kumaon, alt. 8,000 ft.

4. **I. Thomsoni,** *Hk. f.: Fl. Brit. Ind.* i. 469.

Kumaon to Kashmir and Hazara, alt. 5,000-12,000 ft.—Extends eastward to Sikkim.

VAR. **ecalcarata**.

Dhurmsala, Laka, alt. 11,000 ft.

5. **I. amplexicaulis,** *Edgew.: Fl. Brit. Ind.* i. 469.

Kumaon to Sirmore, alt. 6,000-12,000 ft.

6. **I. bicornuta,** *Wall.: Fl. Brit. Ind.* i. 475.

Kumaon and Garhwal, alt. 9,000-10,000 ft.—Extends eastwards to Sikkim.

7. **I. bicolor,** *Royle.* I, amphorata, I. umbrosa *and* I. pallens, *Edgew.: Fl. Brit. Ind.* i. 475.

Kumaon to Kashmir and Hazara, alt. 4,000-60,000 ft.—Extends eastward to Central Nepal.

This and *I. Thomsoni* are perhaps the most common Balsams in the Western Himalaya. The lip varies greatly in form, from saccate with a short incurved spur, to infundibular with a very slender much longer spur.

8. **I. Lemanni,** *Hk. f. & T.* in *Journ. Linn. Soc. Bot.* iv. (1860) 154; *Aitch.* l.c. xix (1882) 155 (Lehmanni).

Kurrum valley; margins of stoney streams, alt. 6,000-8,000 ft. First described from specimens collected by Griffith at Otipore in Affghanistan. The plant collected by Aitchison in the Kurram valley is, I think, the same, but more and better specimens are wanted for comparison. Aitchison describes two species as inhabiting the Kurram valley; one he refers to *I. Lemanni,* which ascends to the lower limit of the other, which he refers to *I. amphorata,* Edgew. (*I. bicolor* Royle): the latter however differs greatly from *I. amphorata,* and approaches very closely to *I. Thomsoni*; it is my *I. Aitchisoni,* see below. The trans-Indus species of *Impatiens* are very imperfectly known.

9. **I. violoides,** *Edgew. MS. in Herb. Oxon.*

Between Pikha and Janglig (Kumaon ?), October, 1834.

The only specimens which I have seen are very imperfect. One in the Bentham Herbarium has a ticket inscribed '*Impatiens candida*, Lindl., near Junglung, alt. 8-9,000 ft.' I cannot find the localities named. *I. candida*, Lindl., is a very different plant, a white flowered state of *I. Roylei*, Walp. The caphiform lip and absence of spur render *I. violoides* easy of recognition.

10. I. Aitchisoni, *Hk. f.* n. sp. I. amphorata, *Aitch.*, *non Edgew.* in *Journ. Linn. Soc.* xix (1880) 155.

Kurram valley, alt. 8,000-9,000 ft.

11. I. Balfourii, *Hk. f.: Bot. Mag.* t. 7,878.

Kashmir, in the Jhelum valley, Garki, *Inayat.*

12. I. Flemingii, *Hk. f.* n. sp.

Murree; Kashmir, alt. 6,500-8,000 ft.; and Hazara.

13. I. Edgeworthii, *Hk. f.: Fl. Brit. Ind.* i. 476. I. chrysantha, *Hk. f.*, *Bot. Mag.* t. 7786.

Kulu; Beas valley, alt. 4,000-6,000 ft. Chamba. Kashmir, alt. 5,000-8,000 ft. Hazara; Kagan valley.

§ 3.

14. I. tingens. *Edgew.* I. racemosa, *Wall. Cat.* 4,730 *partim, non DC.; Fl. Brit. Ind.* i. 479. I. laxiflora, *var.* Stracheyi, *Fl. Brit. Ind.* l. c. 480.

Kumaon to Sirmore, alt. 5,000-10,000 ft.—Extends eastwards to Central Nepal.

15. I. racemosa, *DC.* I. laxiflora, *var.* khasiana, *Fl. Brit. Ind.* i. 480.

Kumaon to Kashmir, alt. 4,000-8,000 ft.—Extends eastward to Sikkim.

VAR. **ecalcarata**; spur very short or 0.

Kumaon to Garwhal, alt. 4,000-7,000 ft.

16. I. laxiflora, *Edgew.: Fl. Brit. Ind.* i. 479, excl. vars. 2, 3, 4. I. micranthemum, *Edgew.: Fl. Brit. Ind.* l. c. 481. excl. var. 2.

Kumaon to Kashmir, alt. 6,000-11,000 ft.—Extends eastward to Sikkim. This species may be recognized by the two minute (black when dry) corpuscles, one on each side of the base of the standard; these are representatives of a second pair of sepals

Cleistogamous and spurless states **occur at high elevations**; **these** all have the black corpuscles.

17. I. brachycentra, *Kar. & Kir.: Fl. Brit. Ind.* i. 481.

Kumaon to Kashmir and Chitral, alt. 6-12,400 ft.; Garhwal, to 13,000-14,000 ft.—The minute flowers are mostly cleistogamous. The leaves vary from serrulate to crenate.

18. I. parviflora, *DC. Prod.* i. 687.

Kashmir, Kishtwar and Hazara, alt. 3,500 to 8,000 ft..—Extends northward to Siberia.

§ 4.

19. I. Inayatii, *Hk. f.* n. sp.

Kumaon; Kali valley, Sosa forest, *Inayat.*—A remarkable large-leaved and -flowered species, only once found.

§ 5.

20. I. cristata, *Wall. in Roxb. Fl. Ind. ed. Carey* ii. 456. I. tricornis, *Lindl.* I. scabrida, *Fl. Brit. Ind.* i. 472 *partim, non D.C.; Wight, Ic.* t. 323; *Collett, Flor. Simlens.* 74. I. Hamiltoniana, *D. Don, Prodr. Fl. Nep.* 204.

Kumaon to Kunawur, alt. 6,000-10,000 ft.—Extends eastward to Bhotan.

21. I. scabrida, *DC. Prodr.* i. 687, *non Wall. Cat.* 4,769. I. scabrida, *partim, Fl. Brit. Ind.* i. 472. ?I. calycina. *Wall. in Roxb. Fl. Ind. ed. Carey* ii. 463.

Kumaon, alt. 5,000-9,000 ft. Extends eastward to Central Nepal.—Difficult to distinguish by herbarium specimens from *I. cristata*, the flowers are smaller, the lip never saccate, the basal lobe of the wings rounded at the base, the spur very variable in length.

22. I. glauca, *Hk. f. & T.; Fl. Brit. Ind.* i. 482.

Kumaon and Garhwal, alt. 7,000-10,000 ft.; Kangra valley Surram, alt. 9,500 ft.—The only Indian species allied to the European and Siberian *I. Nolitangere*, in habit and in the broad crenatures of the leaf-margins.

23. I. serrata, *Benth.*: non *Fl. Brit. Ind.* i. 473.

Kumaon; Gori valley, at Ritkott.—The *I. serrata* of F. B. I. from Sikkim is *I. falcifer*, Hk. f.

24. I. serrulata, *Hk. f.* n. sp.

Kumaon; Ralam valley, at Saba Udiyar.

(*To be continued.*)

G. I. C. P. O.—No. 1906 D. B. S. I.—3-101-4.—450.—B. N. D.

AN EPITOME OF THE BRITISH INDIAN SPECIES OF *IMPATIENS.*

By J. D. Hooker.

Part II.

Additional Western Himalayan Species.

Impatiens Duthiei, Hk. f. nov. sp.

This apparently distinct undescribed species from the Western Himalaya has been received by me from Mr. Duthie since the publication of Part I of the Epitome. It is closely allied to *I. bicolor*, Royle, but the raceme is not interrupted by the pedicels of the flowers being fascicled or umbellate, the bracts are larger and ovate-lanceolate, the sepals orbicular and aristate, and the leaves are of a remarkably membranous consistence.

II.—Species of the Eastern Himalaya, from the Valley of Khatmandu in Central Nepal to the Mishmi Hills in Upper Assam, including the Tibetan Valley of Chumbi (between Sikkim and Bhotan).

The chief materials procured from this region are, firstly, the collection made by Wallich in the Khatmandu Valley (Central Nepal) in 1826. It comprises about 15 species, of which 5 have not hitherto been collected elsewhere. Secondly, my own Sikkim collections, made in 1848 and 1849, followed by those of Mr. C. B. Clarke (with very valuable notes), Dr. Treutler, Dr. King's collections (for the Royal Botanical Gardens, Calcutta), Mr. Gamble and more recently those of Messrs. Pantling and G. A. Gammie, made with special care. Mr. Pantling's are accompanied with coloured drawings and analyses of about 20 species, made by himself, that have proved invaluable aids to me.

A very few species were collected in Bhotan by Dr. Griffith during Captain Bogle's mission to that country in 1837-38 which took place in the winter months; and a few in the Mishmi Hills, also by Dr. Griffith, during his adventurous journey in that region in 1836.

The Balsam Flora of Sikkim is far from exhausted. The Kew Herbarium contains specimens in too imperfect a condition to be determined, and the smaller species of the sub-alpine region, have never been well collected. I have little doubt that when the flora of the Western Himalaya becomes better known it will prove one of the richest in the world in Balsams.

Key to the principal sections.

SERIES *A*.—Capsule short, turgid in the middle.
  I.—Inflorescence truly terminal, § 1.
  II.—Inflorescence axillary, § 2, 3, 4.

SERIES *B*.—Capsule elongate, linear or clavate.
  I.—Bracts at the base of the pedicels, or o.
    Inflorescence racemose, § 5, 6, 7.
    Inflorescence of solitary or fascicled axillary pedicelled flowers, § 8.
  II.—Bracts in the pedicels of a short few-fld., raceme, rarely at the base or o, § 9.

Key to the species.

SERIES *A*.—Capsule short, turgid in the middle, contracted at both ends.

I.—Inflorescence truly terminal.

§ 1. *Raceme spiciform ; bracts fimbriate persistent ; seeds with basal spiral hairs* . . . . 1. *I. bracteata* Coleb.

II.—Inflorescence axillary.

§ 2. *Stem stout ; leaves a ternate ; peduncles 1-5-fld.; flowers large ; sepals broad, membranous ; seeds with basal spiral hairs.*

Sepals 2, cuspidate—
  Lip infundibular, spur slender, tip annular . . 2. *I. pulchra* Hk. f. & T.
  Lip scaphiform, spur very long, slender . . 3. *I. latiflora* Hk. f. & T.
Sepals 4, two outer apiculate, two inner much longer.
  Lip subsaccate, spur incurved . . . 4. *I. mishmiensis* Hk. f.

§ 3. *Leaves alternate; flowers solitary or fascicled, pedicelled in the axils of the leaves (peduncle o); seeds smooth glabrous.*

Leaves linear-lanceolate, capsule tomentose . . 5. *I. Balsamina* L.

§ 4. *Leaves opposite alternate and pseudo-verticillate; inflorescence of long or short axillary peduncles bearing solitary binate or fascicled pedicelled flowers; capsule and seeds glabrous*—Peduncle sometimes o in *I. exilis.*

Lip saccate, shortly abruptly spurred :—
  Peduncle long, tips of sepals thickened . , . . 6. *I. trilobata* Coleb.
  Peduncle short, sepals acuminate . . . 7. *I. tripetala* Roxb.
Lip saccate, base narrowed into a short upcurved spur . . . 8. *I. florigera* C. B. Clarke.
Lip infundibular, tapering into a long slender spur . . 9. *I. infundibularis* Hk. f.
Lip scaphiform, spur very long, slender . . . 10. *I. exilis* Hk. f.

SERIES B.—Capsule elongate linear or clavate, rarely oblong.
I.—Bracts at the base of the pedicels or o.
* Inflorescence racemose.

§ 5. *Leaves opposite alternate or pseudo-verticillate, upper often largest and crowded towards the ends of the stem or branches; inflorescence of erect long-peduncled racemes from the upper leaf-axils, subcorymbosely disposed; pedicels often fascicled or whorled, bracteate at the base; flowers usually large or medium-sized, rose-purple; seeds glabrous.*—Differs from § 7 chiefly in the larger flowers.

Basal lobe of wings spurred or cuspidate on the upper outer margin :—
  Bracts broad, lip saccate 11. *I. sulcata* Wall.
  Bracts narrow, lip infundibular . . . 12. *I. Thomsoni* Hk. f.

Basal lobe of wing rounded, muticous on the outer margin, lip saccate, shortly abruptly spurred or infundibular :—
  Distal lobes of wings caudate :—
    Sepals minute, orbicular, long-awned, gland-tipped, lip sigmoidly incurved . . 13. *I. bicornuta* Wall.
    Sepals ovate acuminate . . . 14. *I. Kingii* Hk. f.
  Distal lobe of wings dolabriform :—
    Leaves ovate crenate 15. *I. bicolor* Royle.
    Leaves ovate serrulate 16. *I. nepalensis* Hk. f.
    Leaves lanceolate serrate . . . 17. *I. insignis* Wall.

§ 6. *Leaves all alternate ; inflorescence of spreading peduncled few-flowered racemes, from the upper or middle leaf-axils, not sub-corymbosely disposed, rachis often bracteate below or between the flowers ; pedicels bracteate at the base ; capsules linear-oblong or narrowly clavate ; seeds glabrous.*

Sepals entire, margins eglandular :—
  Distal lobes of wings dolabriform :—
    Anthers muticous :—
      Lip saccate :—
        Sepals small, ovate or oblong . 18. *I. Jurpia* Ham.
        Sepals large, orbicular . . 19. *I. Cathcartii* Hk. f. & T.
      Lip cymbiform, sepals broadly oblong . . . . . 20. *I. cymbifera* Hk. f. & T.
    Anthers cuspidate . . . 21. *I. discolor* DC.
  Distal lobe of wings loriform :—
    Leaves linear lanceolate, sepals 2 . 22. *I. Prainii* Hk. f.
    Leaves ovate or orbicular, sepals 4 :—
      Outer sepals oblong, winged on one margin . . . . . 23. *I. nummularifolia* Hk. f.
      Outer sepals ovate acute . . 24. *I. scitula* Hk. f.

Sepals glandular on one or both margins, usually dimidiate-ovate :—
Distal lobe of wings with a long loriform tail :—
Leaves 3·8 in. long, mostly sessile . 25. *I. urticifolia* Wall.
Leaves 1-3 in. long, mostly petioled 26. *I. Gamblei* Hk. f.
Distal lobe of wings dolabriform :—
Leaves petioled, membranous, lip saccate . . . . . 27. *I. Wallichii* Hk. f.
Leaves subsessile, thick, lip obconic . 28. *I. Hobsoni* Hk. f.

§7. *Leaves alternate, rarely subverticillate at the top of the stem, crenate, rarely serrate; inflorescence of slender axillary spreading, rarely erect, long peduncled racemes, pedicels rarely binate or whorled, bracteate at the base; flowers small or minute, yellow, rarely rose-purple or white, filaments often contracted at the tip, with free didymous anthers.*—The pedicels are whorled in *I. radiata* and *graciliflora.*

†Flower-buds, exclusive of the spur, globose or sub-globose, plane of mouth of lip horizontal :—
Bracts persistent :—
Lip spurred except in var. of *I. racemosa.*
Pedicels more or less fascicled or whorled :—
Lip with spur $\frac{1}{4}$-$\frac{1}{2}$ in. long . 29. *I. radiata* Hk. f. & T.
Lip with spur 1-1$\frac{1}{2}$ in. long . 30. *I. graciliflora* Hk. f.
Pedicels of flowers regularly seriate :—
Dorsal auricle of wings descending into the spur of the lip :—
Spur of lip slender, auricle filiform . . . 31. *I. tingens* Edgew.
Spur of lip broad, auricle linear . . . . 32. *I. Scullyi* Hk. f.
Dorsal auricle of wings short or 0 :—
Sepals $\frac{1}{7}$ in. long, ovate 3-nerved . . . 33. *I. laxiflora* Edgew,

Sepals $\frac{1}{10}$ in. long, falcate aristate, margin uniglandular on one side . 34. *I. racemosa* DC.

Sepals minute, awn long stout erect . . . 35. *I. microsciadia* Hk. f.

Lip scaphiform, spurless, flowers very small :—

Stem 6 in. high, simple, peduncles capillary . . . 36. *I. minimiflora* Hk. f.

Stem 6-10 in., much-branched . 37. *I. Gammiei* Hk. f.

Bracts deciduous :—

Leaves ovate, lip scaphiform, spur a boss, capsule clavate :—

Leaves 2-3 in., sepals ¼ in., ovate acuminate . . . . 38. *I. tuberculata* Hk. f. & T.

Leaves 1-1½ in., sepals $\frac{1}{10}$ in., oblong aristate . . . 39. *I. aganantha* Hk. f.

Leaves linear-lanceolate :—

Leaves 3-5 in., lip with spur 1 in. 40. *I. leptoceras* DC.

Leaves 2-3 in., lip with spur ½ in. . . . . . 41. *I. odorata* D. Don.

†† Flower-buds, exclusive of the spur, ovoid or oblong, plane of mouth of expanded flower ascending at an acute angle :—

Mouth of lip apiculate or muticous :—

Stem more or less hirsute, sepals 4, outer linear-oblong, inner very slender . . . . . 42. *I. trichocladon* Hk. f.

Stem glabrous :—

Distal lobe of wings loriform :

Sepals $\frac{1}{7}$ in. ovate acuminate, base incurved . . . 43. *I. longipes* Hk. f. & T.

Sepals ¼ in. ovate aristate . 44. *I. Pantlingii* Hk. f.

Sepal $\frac{1}{10}$ in. ovate obtuse, base unilaterally lobulate . . 45. *I. bivittata* Hk. f.

Distal lobe of wings linear oblong:—
Sepals $\frac{1}{7}$ in., falcate, with a stiff
clubbed awn . . . 46. *I. leptocarpa* Hk. f.

Mouth of lip cuspidate or awned:—
Capsule linear, distal lobe of wings loriform:—
Sepals $\frac{1}{7}$ in. sides complicate,
base incurved . . . 47. *I. stenantha* Hk. f.

Capsule clavate:—
Sepals $\frac{1}{10}$ in., uncinate, long-awned . . . . . 48. *I. drepanophora* Hk. f.

Sepals $\frac{1}{10}$ in., obliquely ovate
subacute . . . . 49. *I. citrina* Hk. f.

** Inflorescence of solitary or fascicled pedicelled flowers in the axils of the leaves, peduncle 0 or very short; bracts at the base of the pedicel or 0.

§ 8 *Leaves all alternate, flowers large or medium sized except I. occultans.*

Stem erect, lip spurred:—
Anthers cuspidate, sepals 2, orbicular membranous awned:—
Leaves crenate:—
Glabrous, tip of spur spirally
coiled . . . . 50. *I. spirifer* Hk. f. & T.
Pubescent, tip of spur incurved 51. *I. puberula* DC.
Leaves sub-entire or serrulate . 52. *I. acmanthera* Hk. f.
Anthers muticous:—
Leaves serrate, sepals 4, outer dimidiate-ovate . . . 53. *I. arguta* Hk. f. & T.
Leaves crenate, sepals 2, orbicular
aristate . . . . 54. *I. decipiens* Hk. f.
Stem prostrate, leaves small, flowers
minute, lip spurless . . . 55. *I. occultans* Hk. f.

II.—Inflorescence a peduncled 1-few flowered simple or forked raceme, bracts on the pedicels above their base, rarely at the forks, persistent.

§ 9. *Leaves all alternate; inflorescence much shorter than the leaves; flowers yellow or white, rarely rose-coloured,* *large or small; capsule slender often pendulous; seeds glabrous.*

Leaves crenate, or serrate in *I. cristata* :—
Basal lobe of wing muticous :—
Sepals large orbicular or broadly ovate :—
Leaves green on both surfaces 56. *I. cristata* Wall.
Leaves white beneath . . 57. *I. tropæoliflora* Griff.
Sepals small cymbiform . 58. *I. lutea* Hk. f.
Basal lobe of wing spurred in the sinus . . . . . . 59. *I. uncipetala* C. B. Clarke.
Leaves serrate or toothed :—
Basal lobe of wings large rounded, distal longer than broad :—
Sepals orbicular membranous cuspidate . . . . . 60. *I prætermissa* Hk. f.
Sepals ovate acuminate.
Lip broadly infundibular, spur incurved . . . 61. *I. serratifolia* Hk. f.
Lip scaphiform, spur 0. . 62. *I. serrata* Benth.
Basal lobe of wings very small, distal much broader than long, bilobulate, lobules divaricate . . . . . 63. *I. falcifer* Hk. f.

OBSERVATIONS AND LOCALITIES.

§ 1.

1. **I. bracteata** *Coleb.;* I. fimbriata, *Hook. f.; Fl. Brit. Ind.* i. 461.
Sikkim; Mungpoo, alt. 2,000-4,000 ft.; probably introduced by seed amongst orchids from the Khasia Hills.

§ 2.

2. **I. pulchra** *Hk. f. & T.; Fl. Brit. Ind.* i. 459.
E. Nepal and Sikkim; alt. 2,500-5,000 ft.—Also a native of the Khasia Hills.

3. **I. latiflora** *Hk. f. & T.; Fl. Brit. Ind.* i. 459.
Bhotan ; the Duphla Hills.—Also a native of the Khasia Hills.

4. **I. mishmiensis** *Hk. f.; Fl. Brit. Ind.* i. 476.
Mishmi Hills, at Brahma Kund, *Griffith*, 1836.

§ 3.

5. **I. Balsamina** *Linn.; Fl. Brit. Ind.* i. 453.
Sikkim Terai, alt. 1,000 ft. —Tropical and subtropical India. A short spurred form approaching var. *rosea* (I. *rosea Lindl.*) of the Western Himalaya.

§ 4.

6. **I. trilobata** *Coleb. ; Fl. Brit. Ind.* i. 451 and I. flavida, *Hk. f. & Thoms. l.c.* 452.
Sikkim, alt. 1,000-4,000 ft.—Also a native of Assam and Silhet.

7. **I. tripetala** *Roxb.; Fl. Brit. Ind.* i 470.
Sikkim and Bhotan, alt. 2,000-5,000 ft.—Also a native of Assam and Silhet.

8. **I. florigera** *C. B. Clarke.*
Sikkim, alt. 1,000-5,000 ft.

9. **I. infundibularis** *Hk. f.;* nov. sp.
Sikkim, alt. 1,000-4,000 ft.

10. **I. exilis** *Hk. f.;* I. filicornu, *C. B. Clarke* Mss. *non. Hk. f.*
Sikkim, alt. 2,000-5,000 ft.

§ 5.

11. **I. sulcata** *Wall.; Fl. Brit. Ind.* i. 469.
Nepal and Sikkim, alt. 9,000-13,000 ft.—Also a native of the Western Himalaya.

12. **I. Thomsoni** *Hk. f.; Fl. Brit. Ind.* i. 469.
Sikkim, alt. 12,000 ft.—Also a native of the Western Himalaya.

13. **I. bicornuta** *Wall.; Fl. Brit. Ind.* i. 475.
Nepal and Sikkim. alt. 8,500-10,000 ft.—Also a native of the Western Himalaya.

14. **I. Kingii** *Hk. f.;* nov. sp.
Sikkim, alt ?
Possibly referable to § 6. A very handsome species, but specimens in bad condition for analysis.

15. **I. bicolor** *Royle.*; I. amphorata, umbrosa and pallens, *Edgew.*, *Fl. Brit. Ind.* i. 475.
Central Nepal.—Also a native of the Western Himalaya.

16. **I. nepalensi** *Hk. f.*; nov. sp.
Central Nepal.

17. **I. insignis** *Wall.*; *Fl. Brit. Ind.* i. 477.
Central Nepal.

§ 6.

18. **I. Jurpia** *Ham.*; *Fl. Brit. Ind.* i. 471.
Central Nepal and Sikkim; alt. 2,000 to 6,000 ft.—Also a native of the Khasia Hills.

19. **I. Cathcartii** *Hk. f. & Thoms.*; *Fl. Brit. Ind.* i. 473
Sikkim, alt. 2,000-5,000 ft.

20. **I. cymbifera** *Hk. f. & Thoms.*; *Fl. Brit. Ind.* i. 474.
Sikkim; alt. 6,000-11,000 ft.

21. **I. discolor** *DC.*; *Fl. Brit. Ind.* i. 471.
Central Nepal and Sikkim, alt. 4,500-9,000 ft.

22. **I. Prainii** *Hk. f.*; nov. sp.
Sikkim, alt. 10,000 ft. ?

23. **I. nummularifolia** *Hk. f.*; nov. sp.
Sikkim, alt. 10,000-12,000 ft. ?

24. **I. scitula** *Hk. f.*; nov. sp.
Chumbi; alt ?

25. **I. urticifolia** *Wall.*; *Fl. Brit. Ind.* i. 474.
Central Nepal and Sikkim, alt. 10,000-11,000 ft.

26. **I. Gamblei** *Hk. f.*; nov. sp.
Sikkim and Chumbi, alt. 8,000-12,000 ft.

27. **I. Wallichii** *Hk. f.*; nov. sp.
Central Nepal and Sikkim, alt. 10,000-11,000 ft.

28. **I. Hobsoni** *Hk. f.*; nov. sp.
Sikkim, Yatung, alt ?

§ 7.

29. **I. radiata** *Hk. f.*; *& T.*; *Fl. Brit. Ind.* i. 476.
Sikkim, alt. 7,000-12,000 ft.—Also a native of the Khasia Hills.

30. I. graciliflora *Hk. f.;* nov. sp.
Sikkim, alt. 6,000-7,000 ft.

31. I. tingens *Edgew.* I. racemosa; *Fl. Brit. Ind.* i. 479; *non DC.*
Central Nepal.—Also a native of the Western Himalaya.

32. I. Scullyi *Hk. f.;* nov. sp.
Central Nepal.

33. I. laxiflora *Edgew.; Fl. Brit. Ind.* i. 479 (*excl.* var. 2, 4).
Sikkim, alt. 9,000-12,000 ft.—Also a native of the Western Himalaya.

34. I. racemosa *DC.*, I. laxiflora, var. 4; *Fl. Brit. Ind.* i. 479.
E. Nepal, Sikkim and Chumbi, alt. 7,000-10,000 ft.—Also a native of the Western Himalaya and the Khasia Hills.

35. I. microsciadia *Hk. f.;* nov. sp.
Sikkim, alt. 6,000 ft.

36. I. minimiflora *Hk. f.;* nov. sp.
Sikkim, alt. 10,000 ft.

37. I. Gammiei *Hk. f.;* nov. sp.
Sikkim, alt. 10,000 ft.

38. I. tuberculata *Hk. f & T.; Fl. Brit. Ind.* i. 478.
Sikkim, alt. 12,000 ft.

39. I. aganantha *Hk. f.;* nov. sp.
Chumbi, alt.?

40. I. leptoceras *DC.; Fl. Brit. Ind.* i. 477. *Excl. syn.* I. odorata.
Central Nepal, alt.?

41. I. odorata D. Don.
Central Nepal, alt.?

42. I. trichocladon *Hk. f.;* nov. sp.
Sikkim, alt. 10,000 ft.

43. I. longipes *Hk. f. & Thoms.; Fl. Brit. Ind.* i. 473.
Sikkim, alt. 6,500-10,000 ft.

44. I. Pantlingii *Hk. f.;* nov. sp.
Sikkim, alt. 10,000 ft.

45. I. bivittata *Hk. f.;* nov. sp.
Sikkim, alt. 10,000 ft.

46. I. leptocarpa *Hk. f.*
Sikkim, alt.?

47. I. stenantha *Hk. f.; Fl. Brit. Ind.* i. 478.

Central Nepal and Sikkim, alt. 6,000-11,000 ft.—Also a native of the Khasia and Manipur Hills and China.

48. I. drepanophora *Hk. f.;* nov. sp.

E. Nepal and Sikkim.—Also a native of the Khasia and Manipur Hills.

49. I. citrina, *Hk. f.*
Mishmi Hills.

§ 8

50. I. spirifer *Hk. f. & Thoms.; Fl. Brit. Ind.* i. 471.
E. Nepal, Sikkim and Chumbi, alt. 4,000-7,000 ft.

51. I. puberula *DC.; Fl. Brit. Ind.* i. 470.
Central Nepal and Sikkim, alt. 2,500-8,000 ft.

52. I. acmanthera *Hk. f.;* nov. sp.
Sikkim, alt. 6,000 ft.

53. I. arguta *Hk. f. & Thoms.; Fl. Brit. Ind.* i. 470.

Sikkim and Chumbi, alt. 5,000-7,000 ft.—Also in the Khasia Hills, Burma and China.

54. I. decipiens *Hk. f.;* nov. sp.
Sikkim and Chumbi, alt. 5,000-9,000 ft.?

§ **55. I. occultans** *Hk. f.;* nov. sp.
Sikkim, alt. 12,000-13,000 ft.
A diminutive species of doubtful affinity.

§ 9.

56. I. cristata *Wall., vide supra,* pp. 7, 10.
Central Nepal, Sikkim, Bhotan.—Also in the Western Himalaya.

57. I. tropæoliflora *Griff.; Fl. Brit. Ind.* i. 472 (tropæolifolia).
Mishmi Hills.

58. I. lutea *Hk. f.;* nov. sp.
Sikkim, alt. 5,000 ft.

59. I. uncipetala *C. B. Clarke Mss.,* I. scabrida, *partim; Fl. Brit. Ind.* i. 472.
Sikkim, alt. 6,500-8,500 ft.

60. **I. praetermissa** *Hk. f.;* nov. sp.
Central Nepal.

61. **I. serratifolia** *Hk. f.*, I. serrata, *partim ; Fl. Brit. Ind.* i. 473.

62. **I. serrata** *Benth ; non Fl. Brit. Ind.*
Central Nepal.—Also in Western Himalaya.

63. **I. falcifer** *Hk. f.*, I. serrata, *Fl. Brit. Ind.* i. 473 *in part.*
Sikkim, alt. 7,000-10,000 ft.

III.—Species of the Burmese Region, from Assam to Tenasserim.

The Balsams of this region are very imperfectly known. Except in the Khasia and adjacent Hills no satisfactory collections have been made over the vast area limited as above. Sixteen species were obtained by Wallich and his collectors between 1820 and 1830 from various localities between Assam and Tenasserim, to which a considerable number were added by Griffith in the Khasia Hills in 1835 and 1837. Twenty species were collected by Dr. Thomson and myself also in the Khasia and neighbouring hills in 1850; since which period Mr. C. B. Clarke going over the same ground, and extending his travels to the Naga and Manipur Hills, has added considerably to this number. Other contributors have been the Revd. C. Parish in the Maulmain mountains, and collectors employed by the Royal Botanic Gardens of Calcutta in the Shan and other Hills east of the Irawaddi, but discoveries of the latter have been for the most part units. Mr. C. B. Clarke is the only one who has made notes of many species on the spot where found, and these are of great value.

Judging from the reports of Forest Officers and travellers and having regard to the nature of the hill and mountain ranges of Burma it cannot be doubted that this country is exceedingly rich in Balsams, and when it is considered how few species have been obtained from the 1,500 miles of complicated lofty ranges on the east of the Salwin river, and that not a single species has as yet been obtained from the 500 miles of lofty coast range extending from Chittagong to Cape Negrais, it seems to be impossible to regard the 52 species here enumerated below as giving even a remote idea of the richness of the Balsam Flora of Burma, which is further emphasised by the heterogeneous character of its components. In evidence of the truth of this last observation it is sufficient to point out, that in my attempt to group the species under natural sections I have had to adopt 16 of these; which is 7 more than were required for the 63

East Himalayan species and 8 more than for the 57 Western Peninsular. It cannot well be doubted that ampler materials will increase or reduce or abolish some of these.

Of the 52 Burmese species, 39 are endemic. Of the remainder one, *I. Balsamina*, is not confined to any of the Indian regions: *I. bracteata*, *pulchra*, *latiflora*, *trilobata*, *tripetala*, *arguta*, *Jurpia*, *radiata*, *drepanophora* and *racemosa* are Himalayan, of which *I. arguta* is also Chinese; *I. oppositifolia* and *I. chinensis* are Western Peninsular. None are Malayan Peninsular, but one, *I. Parishii* which has no Burmese ally, is nearly related, both in geographical position and character, to one of that region. A small group § 10, and a few species of other groups inhabit the sea level in Arracan, Lower Burma and Tenasserim. They are inconspicuous and small flowered, and have been for the most part very carelessly collected.

Hitherto the only link that has been discovered between the *Impatiens* of Eastern Burma and those of the coterminous provinces of Western China, is the presence in both of *I. arguta*, and what is more surprising is that the Chinese species belong for the most part to sections of the genus of which there are few or no Indian representatives.

Key to the sections.

SERIES A.—Capsule turgid in the middle, narrowed at both ends.
  I.—Inflorescence truly terminal. Seeds arillate with spiral hairs . . . . . . § 1.
  II.—Inflorescence axillary
    * Seeds arillate with spiral hairs . . . § 2, 3.
    ** Seeds exarillate—
      Annuals . . . . . . § 4-10.
      Perennial . . . . . . § 11, 12.

SERIES B.—Capsule elongated, linear or clavate.
  * Bracts at the base of the pedicels:—
    Inflorescence of axillary pedicelled flowers . . § 13.
    Inflorescence racemose . . . . . § 14.
  * Bracts on the pedicels or o, rarely at the base . § 15.

Key to the species.

SERIES A.—Capsule turgid in the middle, narrowed at both ends.
I.—Inflorescence truly terminal racemose.
§ 1. *Bracts fimbriate, seeds arillate with spiral hairs.*
1. *I. bracteata* Coleb.

II.—Inflorescence axillary.

* Seeds arillate with spiral hairs:—

§2. *Glabrous herbs; leaves alternate narrow; stipulary glands o; peduncle 1-6-fld.; flowers large; sepals 2, broad; dorsal auricle of wings large.*

Bracts lanceolate, spur of lip shor incurved.
2. *I. pulchra* Hk. f. & T.

Bracts linear and lanceolate, spur of lip very long straight.
3. *I. latiflora* Hf. & T.

Bracts large orbicular, spur of lip short incurved.
4. *I. acuminata* Benth.

§ 3. *A glabrous annual; leaves alternate; stipulary glands o; racemes 3-8-fld.; sepals 2, ovate; dorsal auricle of wings o* . . . . 5. *I. racemulosa* Wall

** Seeds ex-arillate, naked or papillose, very rarely slightly hairy:—

§ 4. *Annual; leaves alternate lanceolate; flowers solitary or fascicled, pedicelled in the leaf-axils; sepals 2, very small; dorsal auricle of wings large; capsule tomentose* . 6. *I. Balsamina* L.

§ 5. *Annuals; leaves alternate, mostly crowded towards the top of the stem or branches; stipulary glands minute or o; flowers small, pedicelled in the upper leaf-axils; sepals 2; standard winged; spur very slender:—*

Sepals ovate-lanceolate, fruiting pedicels spreading, capsule glabrous . 7. *I. florulenta* Hk. f.

Sepals very minute, fruiting pedicels decurved from the middle, capsules hairy pendulous . . . 8. *I. curvipes* Hk. f.

§ 6. *Annuals; leaves alternate, stipulary glands o; flowers solitary on axillary pedicels, rotate; sepals 2; standard and distal lobes of wings subequal obcordate; spur of lip very slender:—*

Flowers 1-1½ in. diam., sepals ovate lanceolate . 9. *I. violæfloræ* Hk. f. & T.

Flowers ½ in. diam., sepals minute . . 10. *I. Mokimi.* Hk. f.

7. *Very slender flaccid diffusely branched annuals; leaves alternate; stipular glands o; flowers very small on axillary pedicels; sepals 2 or 4; standard oblong.* The two species of this section are not allied:—

Leaves lanceolate, sepals 2, wings bicuspidate, lip tubiform, spur very short 11. *I. capillipes* Hk. f. & T.

Leaves ovate, sepals 4, outer ovate, basal wing-lobe very small, lip infundibular, spur slender . . . 12. *I. micromeris* Hk. f.

§ 8. *Glabrous or hairy annuals; leaves alternate, ovate or oblong; inflorescence of 1-4-fld. axillary peduncles, if 1-fld. bracteate about the middle, if 2-4-fld. bracts at the base of or on the pedicels; flowers large or medium-sized; sepals 2, rather large, dorsal auricle of wings usually large; lip broadly infundibular, narrowed into an incurved or involute slender spur; filaments slender.*—A natural group of which the species are rather difficult of diagnosis.

Basal lobe of wings rounded in front (not cuspidate or spurred); leaves crenate-serrate:—

Stem petioles and peduncles more or less hairy:—

Leaves 1-3 in. membranous crenate, sparsely pubescent; sepals ⅛ in. long, ovate-lanceolate . . 13. *I. porrecta* Wall.

Leaves 3-5 in. and stout stems tomentose, sepals ½ in. long obliquely ovate hairy . 14. *I. khasiana* Hk. f.

Stem thick stout, tomentose, leaves 2-4 in. broad, sepals ⅓ in. ovate lanceolate aristate 15. *I. Marianæ* Reich. f.

Stem very short creeping below, tomentose, sepals ⅙-in. broadly oblong cuspidate hairy . . . 16. *I. Mannii* C.B.C.

Stem petioles and peduncles glabrous or nearly so :—

Stem much branched, sepals ⅓ in. orbicular or broadly ovate, tip of spur annular . . 17. *I. annulifer* Hk. f.

Stem sub-simple stout, leaves 3-5 in. long, sepals orbicular mucronate, spur simply incurved . . 18. *I. burmanica* Hk. f.

Stem short simple, leaves 1½-2 in. long, sepals ⅛ in. ovate falcate, spur simply incurved . . 19. *I. Andersoni* Hk. f.

Basal lobe of wings spurred or cuspidate on the upper outer margin ; leaves serrulate :—

Glabrous, creeping, sepals ⅛ in. long, basal wing-lobes spurred . . 20. *I. cuspidifera* Hk. f.

Glabrous, erect, sepals $\frac{1}{7}$ in. long, basal wing-lobes cuspidate . . 21. *I. striolata* Hk. f.

Stem tomentose above, leaves black when dry, basal wing-lobes cuspidate . . 22. *I. nigrescens* Hk. f.

§ 9. *Annuals; leaves opposite alternate rarely subverticillate, stipular glands often many, subulate clavate or digitiform; infl. of 1-few-fld. peduncles or solitary or fascicled pediceiled flowers; sepals 2; dorsal auricle of wings large; spur of lip long or short, filaments usually slender:—*

Seeds tubercled or granulate:—

Leaves opposite alternate or whorled:—

Peduncle long, 3-5-fld.

Leaves all petioled, standard muticous or dorsally gibbous . 23. *I. trilobata* Coleb.

Leaves upper or all sessile, standard dorsally spurred . . 24. *I. formosa* Hk. f.

Peduncle very short or o . . . . 25. *I. tripetala* Roxb.

Leaves all opposite or whorled, sessile or subsessile, peduncle long or short, stem stout 26. *I. radicans* Benth.

Leaves all alternate petioled, ovate lanceolate, peduncle short or o, stem very slender . 27. *I. stricta* C. B. Clarke.

Seeds globose, smooth black shining, leaves all opposite:—

Leaves sessile or subsessile linear coriaceous:—

Leaf-base truncate or cordate, sepals long linear:—

Flower large . 28. *I. chinensis* L.

Flower small . 29. *I. Helferi* Hk. f.

Leaf-base narrow, flowers large:—
Sepals ovate . 29. *I. Masoni* Hk. f.
Sepals lanceolate 30. *I. Craddockii.* Hk. f.

Leaves ovate or oblong, upper sessile lower petioled membranous:—
Flowers small, sepals linear . 32. *I. oppositifolia* Linn.

§ 10. *Small glabrous annuals; leaves opposite or alternate, stipulary glands o; infl. of long-peduncled many-fld. racemes; flowers very small; dorsal auricle of wings o; capsule very small.*—Of most of the species of this group the specimens are in a very unsatisfactory state. A careful collector in Burma would probably add to their number. All are low-country weedy plants. *I. racemulosa* is the only other conspicuously racemose species of Series A.

Leaves alternate:—
Sepals ovate, wings long-stipitate, basal lobe o, spur of lip inflated . . . . 33. *I. tavoyana* Wall.
Sepals linear, wings long-stipitate, basal lobe ?, spur of lip short incurved . . . 34. *I. circaeoides* Wall.
Leaves opposite or subopposite and alternate:—

Sepals orbicular, wings stipitate, basal lobe minute, spur of lip o, leaves glaucous beneath . 35. *I. peguana* Hk. f.
Sepals oblong, wings stipitate, basal lobe ?, spur of lip short strict acute, pedicels short, leaves glaucous beneath . 36. *I. rangoonensis* Hk. f.

Sepals linear, wings ?, spur of lip short incurved tubiform, pedicels long capillary, leaves concolorous . . . . 37. *I. Brandisii* Hk. f.

§ 11. *A glabrous shrub ; leaves opposite and alternate ; infl. a short few fld. peduncle ; flowers large shortly pedicelled ; bracts large herbaceous ; sepals 4, outer orbicular, inner linear ; seeds large, broad, smooth, glabrous* . . . 38. *I. lævigata* Wall.

§ 12. *A stout fleshy biennial or perennial ; leaves few, large, alternate, long-petioled serrulate; flowers solitary, long-pedicelled ; sepals 2, large, orbicular ; lip scaphiform with a very short bicrural spur, adnate to the middle of the base.*—A remarkable species allied to *I. macrochila* of the Malay Peninsula 39. *I. Parishii* Hk. f. & T.

SERIES B.—Capsule narrow, linear or clavate. Seeds glabrous.

* Bracts at the base of the pedicels :—

§ 13. *Glabrous annuals ; leaves alternate ; flowers large, pedicels solitary or fascicled to the axils of the leaves, rarely on a very short peduncle ; sepals 2 or 4 ; dorsal auricle of wings large.* A considerable section in the Himalaya, unknown in the Western and Malaya Peninsulas.

Sepals 4, outer dimidiate-ovate :—
Leaves ovate or ovate-lanceolate 40. *I. arguta* Hk. f. & T.
Leaves linear-lanceolate . 41. *I. Wattii* Hk. f.
Sepals 2 suborbicular, leaves ovate . . . 42. *I. psittacina* Hk. f.

§ 14. *Leaves alternate ; infl. a long peduncled axillary raceme of large flowers ; sepals 2 ; standard dorsally spurred ; dorsal auricle of wings large.*—A large section in the Himalaya, absent in the Eastern and Western Peninsulas :—

Perennial ?, leaves large, glabrous or puberulous . . . 43. *I. Jurpia* Ham.

§ 15. *Annual glabrous herbs ; leaves alternate, often crowde towards the tips of the stem and branches ; infl. of long-peduncled racemes of small flowers ; sepals 2, small or* *minute; lip scaphiform, infundibular or tubiform, often long-spurred.*—This section which abounds in the Himalaya is absent in the Western and Malayan Peninsulas.

† Flower-buds, excluding the spurs, globose, mouth of lip of expanded flowers horizontal or nearly so :—
Pedicels and bracts mostly whorled or fascicled . 44. *I. radiata* Hk. f. & T.
Pedicels seriate :—
Leaves crenate, sepals ovate falcate . . 45. *I. racemosa* DC.
Leaves crenate-serrate, sepals broadly ovate . 46. *I. paludosa* Hk. f. & T.

†† Flower-buds, excluding the spur, ovoid or ellipsoid, mouth of lip of expanded flowers ascending at an acute angle :—
Bracts persistent, sepals obliquely ovate :—
Stem stout, leaves lanceolate . . . . 47. *I. angustiflora* Hk. f.
Stem slender, leaves ovate . . . 48. *I. bracteolata* Hk. f.
Bracts caducous :—
Lip spurred :—
Stem erect, sepals uncinate long-awned . . 49. *I. drepanophora* Hk. f.
Stem prostrate creeping, sepals obtuse . . 50. *I. prostrata* Hk. f.
Lip spurless, flowers minute 51. *I. depauperata* Hk. f.

** Bracts on the pedicels of a few-fld. raceme, rarely at the forks or 0.

§ 16. *Glabrous or pubescent annuals; leaves alternate, stipular glands 0; sepals 2 or 4; dorsal auricle of wings large; capsule slender :—*

Sepals 4, outer orbicular, inner shorter . 52. *I. manipurensis* Hk. f.

OBSERVATIONS AND LOCALITIES.

§ 1.

1. I. bracteata *Coleb.*, vide ante, p. 18.
Khasia Hills alt. 2,500-5,000 ft.—Also in Sikkim, naturalized?

§ 2.

2. I. pulchra *Hk. f. & T.*, vide ante, p. 18.
Khasia Hills, alt. 4,000-5,000 ft.—Also in Sikkim.

3. I. latiflora *Hk. f. & T.*, vide ante, p. 19.
Khasia and Naga Hills, alt. 2,500-4,000 ft.—Also in the Eastern Himalaya.

4. I. acuminata *Benth.; Fl. Brit. Ind.* i. 462.
Khasia and Jyntea Hills, alt. 3,500-5,000 ft.

§ 3.

5. I. racemulosa *Wall.; Fl. Brit. Ind.* i. 468.
Khasia Hills, alt. 4,000-5,000 ft.

§ 4.

6. I. Balsamina *Linn.;* vide ante, p. 7.
Silhet, Cachar, Upper and Lower Burma, at low elevations.—Also most parts of warm Asia.

§ 5.

7. I. florulenta *Hk. f.;* nov. sp.
Southern Shan States.

8. I. curvipes *Hk. f.;* nov. sp.
Southern Shan States, all 4,000 ft.

§ 6.

9. I. violæflora *Hk. f.; Fl. Brit. Ind.* i. 457.
Tenasserim; Maulmain Hills.

10. I. Mokimi *Hk. f.;* nov. sp.
Upper Burma; Kachin Hills.

§ 7.

11. I. capillipes *Hk. f. & T.*
Tenasserim; Maulmain Hills.

12. I. micromeris *Hk. f.;* nov. sp.
Tenasserim.

§ 8.

13. I. porrecta *Wall.; Fl. Brit. Ind.* i. 472. I. bella, *Hk. f. & Thoms.* l. c. 458.
Khasia, Naga and Manipur Hills, alt. 2,000-5,000 ft.

14. I. khasiana *Hk. f.*; nov. sp. I. bella, VAR. major, *Fl. Brit. Ind* i. 459.
Khasia Hills, alt. 5,000-6,000 ft.

15. I. Marianæ *Reichb. f.*; nov. sp.
Assam.

16. I. Mannii *C. B. Clarke*; nov. sp.
Assam.

17. I. annulifer *Hk. f.*; nov. sp.
Naga and Manipur Hills, alt. 3,000-5,500 ft.

18. I. burmanica *Hk. f.*; nov. sp.
Upper Burma, Bhamo and Kachin Hills.

19. I. Andersoni *Hk. f.*; nov. sp.
Shan States; Hœtone.

20. I. cuspidifera *Hk. f.*; nov. sp.
Naga Hills, alt. 6,000 ft.

21. I. striolata *Hk. f.*; nov. sp.
Khasia Hills, alt. 1,000-5,000 ft.

22. I. nigrescens *Hk. f.*; nov. sp
Assam.

§ 9.

23. I. trilobata *Coleb.*, see ante, p. 19.
Assam, Silhet and Cachar, at low elevations.—Also in Sikkim.

24. I. formosa *Hk. f.*; nov. sp. I. trilobata, *partim Fl. Brit. Ind.* i. 451.
Khasia Hills, alt. 4,000-5,500 ft.

25. I. tripetala *Roxb.*, see ante, p. 19.
Assam, Silhet and Cachar, at low elevations.—Also in Sikkim and N. E. Bengal.

26. I. radicans *Benth.; Fl. Brit. Ind.* i. 451. I. salicifolia, *Hk. f. & T.* l. c. 450.
Khasia, Jyntea and Manipur Hills, alt. 2,000-5,000 ft.

27. **I. stricta** *C. B. Clarke;* nov. sp.
Khasia and Manipur? Hills, alt. 750-2,500 ft.

28. **I. chinensis** *Linn.; Fl. Brit. Ind.* i. 444.
Assam, Silhet, Khasia and Manipur, Mandalay and Shan Hills, alt. 3,000-5,500 ft.—Also in the Malabar Ghats.

29. **I. Helferi** *Hk. f.;* nov. sp.
Tenasserim.

30. **I. Masoni** *Hk. f.;* nov. sp.
Upper Burma, Mandalay district.

31. **I. Craddockii** *Hk. f.;* nov. sp.
Upper Burma; Nahi.

32. **I. oppositifolia** *Linn.; Fl. Brit. Ind.* i. 448.
Rangoon and Maulmain.—Also in the Western Peninsula and Ceylon.

§ 10.

33. **I. tavoyana** *Benth.; Fl. Brit. Ind.* i. 468.
Tavoy.

34. **I. circæoides** *Wall.; Fl. Brit. Ind.* i. 453.
Pegu and Maulmain.

35. **I. peguana** *Hk. f.;* nov. sp. I. circæoides, *in part, Fl. Brit. Ind.* l. c.
Pegu.

36. **I. rangoonensis** *Hk. f.;* nov. sp.
Pegu; Rangoon.

37. **I. Brandisii** *Hk. f.;* nov. sp.
Tenasserim; at Thoungyeen.

§ 11.

38. **I. lævigata** *Wall.; Fl. Brit. Ind.* i. 473.
Khasia, Naga and Manipur Hills, alt. 2,000-5,000 ft.

§ 12.

39. **I. Parishii** *Hk. f.; Fl. Brit. Ind.* i. 456.
Maulmain.

§ 13.

40. **I. arguta** *Hk. f. & T.;* vide ante, p. 22.
Khasia, Naga and Shan Hills.—Also in Sikkim and China.

41. **I. Wattii** *Hk. f.;* nov. sp.
Manipur Hills, alt. 3,000-5,000 ft.

42. **I. psittacina** *Hk. f.; Bot. Mag.* t. 7809.
Shan States.

§ 14.

43. **I. Jurpia** *Ham.*, see ante, p. 20.
Khasia Hills, alt. 4,000-5,000 ft.—Also in Nepal and Sikkim.

§ 15.

44. **I. radiata** *Hk. f. & T.*, vide ante, p. 20.
Khasia Hills, alt. 4,000-5,000 ft.—Also in Sikkim.

45. **I. racemosa** *DC.*, vide ante, p. 21.
Khasia Hills, alt. 4,000-5,000 ft.—Also in the Eastern and Western Himalaya.

46. **I. paludosa** *Hk. f. & T.; Fl. Brit. Ind.* i. 480.
Khasia Hills, alt. 4,000-6,000 ft.

47. **I. angustiflora** *Hk. f.; Fl. Brit. Ind.* i. 481 *in part.*
Khasia Hills, alt. 5,000 ft.

48. **I. bracteolata** *Hk. f.;* nov. sp. I. angustiflora, *in part, Fl. Brit. Ind.* i. 481.
Khasia Hills, alt. 5,000 ft.

49. **I. drepanophora** *Hk. f.*, vide ante, p. 22.
Khasia, Jyntea, Naga and Kachin Hills, alt. 5,000-5,500 ft.—Also in Sikkim.

50. **I. prostrata** *Hk. f.;* nov. sp.
Manipur, alt. 5,500 ft.

51. **I. depauperata** *Hk. f.;* nov. sp.
Khasia Hills, alt. 4,000-5,000 ft.

§ 16.

52. **I. manipurensis** *Hk. f.;* nov. sp.
Manipur.

Undeterminable species *I. assamensis, Griff Notul,* iv, 459; *Ic. Pl. Asiat* t. 529.—Assam, on sandy banks of the Brahmaputra, near Dibong Mooka, *Griffith*, 1836. The description and plate are at variance and irreconcilable.

G. I. C. P. O.—No. 673 D. B. S. I.—20-6-1905.—450—P. M. M.

AN EPITOME OF THE BRITISH INDIAN SPECIES OF *IMPATIENS.*

By J. D. Hooker.

PART III.

IV.—Species of the Western (Deccan) Peninsula, from Central India to Travancore.

The collections upon which the following Epitome of the Balsams of the Western Peninsula is founded are amongst the earliest formed in our Indian possessions. Of these the first are those of Koenig, a Danish physician, who resided in India between 1768 and 1775. Following him was a body chiefly of missionaries, who formed an association* for the purpose of investigating the Flora of the Southern districts of the Madras Presidency during the last decades of the 18th century and first of the 19th. Of these, the most active members were the three botanists, Kleine, Heyne and Rottler. Specimens of most of their discoveries were deposited in the Museum of the Honourable East India Company, the duplicates of which were distributed by Dr. Wallich, and are included in his "numerical list of dried specimens in the East India Company's Museum (1828 *et seq.*)" But by far the greatest explorer and exponent of Peninsular Indian Botany was Dr. R. Wight, who, arriving in India in 1819, continued his labours as collector, describer and illustrator of the Madras Flora till his return to England in 1853. The greater number of the Balsams here enumerated were known to, and about half of these figured for the first time by him. Wight was succeeded worthily by Colonel Beddome, who discovered, chiefly in Travancore, and published with figures about a dozen species of *Impatiens* unknown to his predecessors. In this elaboration of the Peninsular Balsams I have to record my obligation to Mr. Thurston for the loan of the species contained in the Herbarium of the Madras Museum, forwarded to me by its Curator C. A. Barber, Esq., M.A., F.L.S., Government

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* For details respecting the early botanical collections in the Peninsula, see Preface, p. xi, of Wight and Arnott's "Prodromus Floræ Peninsulæ Indiæ Orientalis".

Botanist. This Herbarium is very rich in beautifully preserved specimens of almost all the Southern Peninsular species, and includes several not previously described, together with a fine collection of coloured drawings of many. Lastly, I have been entrusted with the loan of the Balsams collected by Mr. W. A. Talbot, F.L.S., of the Bombay Forest Department, consisting of well-preserved specimens amongst which those from the Baba Budan Hills, the scene of the labours of the early missionaries are of special interest.

With the exception of *I. Balsamina*, which inhabits hilly districts all over the Peninsula, the genus is confined to the Western Ghats and to the mountains of Madura and Tinnevelli in the extreme south, and diminishes in number of species passing from south to north. No fewer than 24 species are endemic south of Lat. 8° S. Of the northern limit of the genus in the range there is no evidence. Probably no endemic species is found north of Mahableshwar in Lat. 18° N. From the Nilgiri Hills to Cape Comorin 54 species have been described; of which only 12 inhabit the Bombay Ghats, together with 5 that are endemic in that Presidency, collected by Messrs. Gibson, Law, Stocks, and Talbot.

In respect of sectional characters the Peninsular Balsams are in marked contrast to the Himalayan and Burmese. Of the two main groups of the genus, the short capsuled and long capsuled, not one of the latter, is to be found in the Ghats. Two of the sections, § *Scapigeræ* and § *Epiphyticæ* are (with the exception of one species of the first being found also in Ceylon) confined to the Peninsula, in which there is no representative of the East Himalayan § 9, (= Burmese § 16,) with bracts on (not at the base of) the pedicels of the flowers, nor is there of the Eastern Himalayan § 7 (= Burmese § 15) with small racemose long-spurred flowers. Of species common to Northern or Eastern India there are but three in the Peninsula, *I. Balsamina chinensis*, and *oppositifolia*. Seven Peninsular species are found in Ceylon *I. acaulis*, *chinensis*, *oppositifolia*, *Balsamina*, *flaccida*, *Hensloviana* and *grandis*.

Of species that may be regarded as abnormal in character there are the first two sections mentioned above, (*Scapigeræ* and *Epiphyticæ*) and seven species belonging to three sections with the dorsal auricle of the wings produced into the spur of the lip, *I. Denisonii*, *Barberæ*, *Lawsoni*, *ligulata*, *Goughii*, *viscida* and *omissa*. It is remarkable that of the 61 Peninsular species, not one has the two additional lateral sepals which so frequently occur in both Western and Eastern Himalayan and in Burmese species.

The extraordinary evolution into varieties of *I. Balsamina* in the Western Ghats especially, is a remarkable feature of that species, which in the south-west of the Peninsula finds its maximum of development. Its various forms which I have endeavoured to distinguish in this Epitome, (see appendix, p. 49) require careful study in a living state, as do most of the species of § 1 and 2, my diagnoses of which from dried specimens and figures do not satisfy me.

Key to the species.

§ 1. Scapigeræ.—*Rootstock tuberous; leaves all radical; scape radical; flowers racemose; seeds very minute, clothed with spiral hairs.*

Lip with a very long incurved spur :—
Wings 2-lobed . . . 1. *I. acaulis*, Arn.
Wings 3-lobed . . . 2. *I. scapiflora*, Heyne.
Lip with a short spur, wings in all 3-lobed :—
Dorsal auricle of wings obscure or o—
Spur of lip incurved, tip inflated 3. *I. Beddomei*, Hk. f.
Spur of lip incurved cylindric . 4. *I. Levingei*, Gamble.
Spur of lip straight, standard entire . . . . . 5. *I. modesta*, Wt.
Spur of lip short, standard crenate . . . . . 6. *I. crenata*, Bedd.
Dorsal auricle of wings produced into the spur of the lip.
Dorsal auricle long slender :—
Tall, spur of lip elongate . 7. *I. Denisonii*, Bedd.
Dwarf, spur of lip short . 8. *I. Barberi*, Hk. f.
Dorsal auricle short spiniform . 9. *I. Lawsoni*, Hk. f.
Lip spurless :—
Lobes of wings oblong, tips rounded . . . . 10. *I. Stocksii*, Hk. f. & T.
Median and distal lobes of wings subulate . . . . 11. *I. orchioides*, Bedd.

§ 2. Epiphyticæ.—*Perennial, succulent, epiphytic herbs with simple or sparingly branched, very short, often annulate or articulate stems; leaves alternate, usually fascicled at the ends of the* *branches; flowers on simple or branching few-fld peduncles; wings very short, thick, almost concealed in the mouth of the lip and concave standard.*

The species of this section are not satisfactorily delimited and cannot be from herbarium specimens. In a collection of drawings of plants of this section lent to me by the authorities of Madras Museum there are three of this section which I fail to identify.

Lip scarlet:—

Sepals small elliptic green, standard and wings yellow . 12. *I. Jerdoniæ*, Wt.

Sepals large oblong pendulous scarlet, standard green, wings purple . . . . 13. *I. auriculata*, Wt.

Sepals linear green, standard green dorsally broadly winged 14. *I. parasitica*, Bedd.

Lip green, sepals linear-oblong, flowers all green [ex Wt.] . . 15. *I. viridiflora*, Wt.

§ 3. *Annual herbs; leaves opposite; flowers pedicelled, solitary binate or fascicled in the axils of the leaves (peduncle o), ebracteate or minutely bracteate at the base; sepals elongate, linear, rarely ovate or lanceolate; seeds naked, usually globose, black, polished, glabrous.*

Leaves often whorled; sepals ovate and seeds hairy in *I. Gardneriana*; sepals ovate-lanceolate in *I. concinna*. Traces of a suppressed peduncle and of bracts at the base of the pedicels occur in some species.

* Sepals linear or linear-lanceolate; seeds black and shining.

Spur of lip slender, longer than the wings (or shorter or o in var. of *I. diversifolia*).

Stem stiff usually simple, leaves broad or narrow coriaceous serrate . . . . 16. *I. chinensis*, L.

Stem flaccid usually branched, leaves broad or narrow sub-entire . . . . . 17. *I. diversifolia*, Wt.

Stem slender, basal lobe of wings o, dorsal auricle filiform 18. *I. ligulata*, Bedd.

Stem slender flaccid, wings long stipitate, basal lobe minute or o, dorsal auricle o . . 19. ' *Kleinii*, W. & A.

Stem slender flaccid, wings shortly stipitate, basal lobe small, dorsal auricle decurved 20. *I. tenella*, Heyne.

Spur of lip very short or o.

Lip scaphiform or cymbiform

Flowers very small, spur of lip very minute or o . . 21. *I. inconspicua*, Benth.

Flowers medium-sized yellow, standard winged, spur of lip minute or o . . . 22. *I. Lawii*, Hk. f. & T.

Lip saccate, spur of lip very short

Glabrous, flowers very small, lip shortly saccate . . 23. *I. oppositifolia*, L.

More or less pubescent, flowers medium-sized, lip deeply saccate. . . . . . 24. *I. tomentosa*, Heyne.

** Sepals ovate or ovate-lanceolate; seeds various.

Leaves opposite, spur of lip very short, seeds glabrous.

Leaves 2-5 in. long . . 25. *I. Dalzellii*, Hk. f. & T.

Leaves ½-¾ in. long . . . 26. *I. concinna*, Hk. f.

Leaves opposite and whorled, seeds hairy . . . . . 27. *I. Gardneriana*. Wt.

§ 4. Microsepalæ.—*Shrubs and herbs; leaves opposite, alternate and rarely whorled; flowers pedicelled; pedicels solitary, binate or fascicled in the axils of the leaves (peduncle o); sepals small or minute; seeds smooth, rugose or papillose.*

* Leaves opposite alternate and whorled on the same plant, seeds obovoid rugose or papillose.

Shrubs, basal lobe of wings smaller than the distal, spur of lip short incurved.

Leaves 1-2 in. long, petiole short 28. *I. Leschenaultii*, Wall.

Leaves 2-4 in. long, petiole long 29. *I. latifolia*, Linn.

Shrubs, basal lobe of wings equalling or larger than the distal.

Stem and branches glaucous, costa of leaf hairy beneath, spur of lip stout . . . 30. *I. cuspidata*, Wt.

Stem and branches green, leaves glabrous beneath, spur of lip slender . . . . . 31. *I. floribunda*, Wt.
Herb, annual, lobes of wings subequal, spur of lip very slender 32. *I. lucida*, Heyne.

** Leaves all alternate.
Flowers minute; flaccid annuals.
Leaves ovate, spur of lip o 33. *I. pendula*, Heyne.
Leaves lanceolate, spur of lip short . . . . . . 34. *I. mysorensis*, Roth.

Flowers large or medium-sized, smaller in *I. dasysperma* and *Talboti*.
Capsule pilose or tomentose.
Lip spurred, seeds globose smooth . . . . 35. *I. Balsamina*, L.
Lip spurless, seeds minute granulate . . . 36. *I. scabriuscula*, Heyne.

Capsule glabrous, seeds glabrous or papillose, spur of lip long.
Seeds small minutely papillose—
Spur of lip 1-1½ in. . . 37. *I. flaccida*, Arn.
Spur of lip ½ in. . . 38. *I. dasysperma*, Wt.
Seeds larger rugose glabrous.
Flowers large . . . 39. *I. pulcherrima*, Dalz.
Flowers small . . . 40. *I. Talboti*, Hk. f.

§ 5. Tomentosæ.—*Shrubby; leaves alternate, hairy on both surfaces; flowers pedicelled, pedicels solitary in the axils of the leaves (peduncle o), ebracteate; standard and lip tomentose.*

The two species here brought together do not appear to be allied to one another or to any other species.

Flowers small, wings short . 41. *I. Munronii*, Wt.
Flowers very large, wings large 42. *I. Hensloviana*, Arn.

§ 6. Subumbellatæ.—*Herbs or shrubs; leaves opposite or alternate, rarely whorled; flowers umbellate or in very contracted racemes terminating a long axillary peduncle pedicels bracteate at the base.*

The inflorescence of *I. grandis* is sometimes reduced to a single-flowered peduncle with a median bract indicating the insertion of the pedicel.

* Shrubs or large branching herbs; leaves alternate, or opposite and alternate in *I. verticillata.*

Sepals orbicular ovate or oblong ¼ ¾ in. long, leaves alternate.

Spur longer than the limb of the lip.

Flowers very large, sepals oblong acute, lip with spur tubiform . . . . . 43. *I. grandis*, Heyne.

Flowers medium-sized, sepals orbicular cuspidate, bracts slender . . . . . 44. *I. fruticosa*, DC.

Flowers medium-sized, sepals ovate acuminate, bracts ovate . . . . . 45. *I. viscida*, Wt.

Spur shorter than the limb of the lip or o.

Sepals ovate aristately accuminate, spur of lip $\frac{1}{10}$ in. long or o . . . . . 46. *I. campanulata*, Wt.

Sepals oblong acute, spur of lip ¼-⅓ in. long . . . . 47. *I. disotis*, Hk. f.

Sepals linear, leaves opposite and whorled spur long slender . 48. *I. verticillata*, Wt.

** Annual herbs.

Leaves all opposite.—Species all want careful revision.

Dorsal auricle of wings filiform enclosed in the spur of the lip except in var. of *I. omissa*, peduncle many-fld.

Leaves ovate petioled, 1-2 in. long.

Spur of lip shorter or longer than the wings, not inflated 49. *I. G ghii*, Wt.

Spur of lip longer than the wings, inflated . . . . . 50. *I. viscosa*, Bedd.

Leaves oblong or elliptic subsessile ¼-1 in. long . . . 51. *I. omissa*, Hk. f.

Dorsal auricle of wings minute, peduncle 1-fld.
Leaves $\frac{1}{8}$-$\frac{1}{6}$ in. long subsessile . 52. *I. parvifolia*, Bedd.

Leaves all alternate, see also *I. Tangachee* in § 7.
Leaves scattered on the stem and branches :—
Spur of lip long slender . . 53. *I. cordata*, Wt.
Spur of lip short stout . . 54. *I. uncinata*, Wt.
Spur of lip 0 . . . . 55. *I. elegans*, Bedd.
Leaves rosulate at the top of the simple stem :—
Spur of lip long slender . 56. *I. umbellata*, Heyne.
Spur of lip short stout . . 57. *I. travancorica*, Bedd.

§ 7. Racemosæ.—*Shrubs ; leaves alternate ; flowers in elongate peduncled axillary racemes ; pedicels bracteate at the base ; sepals orbicular or broadly oblong ; lip spurred ; seeds various.*

* Leaves long-petioled ovate :—
Distal lobe of wings stipitate with a minute basal lobe at the base of the stipes . . . . 58. *I. maculata*, Wt.
Distal lobe of wings sessile on the basal
Lip tubiform incurved throughout its length . . . . 59. *I. phœnicea*, Bedd.
Lip cymbiform or infundibular, spur short incurved . . 60. *I. Wightiana*, Bedd.

** Leaves subsessile lanceolate . . 61. *I. Tangachee*, Bedd.

OBSERVATIONS AND LOCALITIES.

§ 1.

1. **I. acaulis**, *Arn. ; Fl. Brit. Ind.* i. 443.

Western Ghats ; from the Konkan to Travancore, ascending to 7,000 ft. in the Nilgiris, etc. Also in Ceylon.

2. **I. scapiflora**, *Heyne ; Fl. Brit. Ind.* i. 443. I. verrucosa, *Bedd.* I. rivalis, *Wight. Fl. Brit. Ind.* i. 444.

Western Ghats ; from S. Kanara to Travancore, alt. 6,000-8,000 ft.

3. **I. Beddomei,** *Hk. f.; Fl. Brit. Ind.* i. 442.
Western Ghats; from the Konkan to the Nilgiri Hills, alt. 6,000-8,000 ft.

4. **I. Levingei,** *Gamble;* n. sp.
Western Ghats, Nilgiri Hills, alt. 6,000 ft.

5. **I. modesta,** *Wight; Fl. Brit. Ind.* i. 442.
Western Ghats; Nilgiri Hills, alt. 6,000 ft.; Sivagiri Hills.

6. **I. crenata,** *Bedd; Fl. Brit. Ind.* i. 442. I. Akka, *Bedd.*
S. Western Ghats; Travancore, alt. 5,000-8,000 ft.

7. **I. Denisonii,** *Bedd.; Fl. Brit. Ind.* i. 444.
Western Ghats; Nilgiri Hills, alt. 3,500-5,000 ft.

8. **I. Barberi,** *Hk. f.;* n. sp.
Western Ghats; Mysore State at Cadamany.

9. **I. Lawsoni,** *Hk. f.;* n. sp.
Western Ghats; Nilgiri Hills.

10. **I. Stocksii,** *Hk. f. & Thoms.; Fl. Brit. Ind.* i. 442.
Western Ghats; Konkan and Kanara.

11. **I. orchioides,** *Bedd.; Fl. Brit. Ind.* i. 443.
Western Ghats; Nilgiri Hills, alt. 8,000 ft.

§ 2.

12. **I. Jerdoniæ,** *Wight; Fl. Brit. Ind.* i. 450, *excl.* I. parasitica, *Bedd.*
Western Ghats; Nilgiri Hills, alt. 3,000-5,000 ft.; Anamalai Hills, alt. 7,000 ft.

13. **I. auriculata,** *Wight; Fl. Brit. Ind.* i. 460.
S. Western Ghats; Sivagiri Hills, Travancore, alt. 5,000 ft.

14. **I. parasitica,** *Bedd.;* I. Jerdoniæ, *var.* parasitica, *Fl. Brit. Ind.* i. 460.
S. Western Ghats; Anamalai Hills, Travancore, alt. 5,000-7,000 ft.

15. **I. viridiflora,** *Wight; Fl. Brit. Ind.* i. 460.
S. Western Ghats; Sivagiri Hills, alt. 5,000 ft.

§ 3.

16. **I. chinensis**, *Linn.; Fl. Brit. Ind.* i. 444. See *ante* p. 28.

Western Ghats, from the Konkan to Travancore, ascending to 8,000 ft. in the Nilgiri Hills. Also in Burma and China.

17. **I. diversifolia**, *Wight.; Fl. Brit. Ind.* i. 446.

Western Ghats; from the Konkan to Travancore, ascending in the Nilgiri Hills to 6,000 ft.

18. **I. ligulata**, *Bedd.; Fl. Brit. Ind.* i. 446.

S. Western Ghats; Travancore, alt. 1,000-8,000 ft.

19. **I. Kleinii**, *Wight & Arn.; Fl. Brit. Ind.* i. 445.

Western Ghats; from the Konkan to Travancore, alt. 3,000-6,000 ft.

20. **I. tenella**, *Heyne; Fl. Brit. Ind.* i. 447, *excl.* I. rosmarinifolia, *Retz.*

Western Ghats; Nilgiri Hills, alt. 6,000 ft.

21. **I. inconspicua**, *Benth.; Fl. Brit. Ind.* i. 447. I. rosmarinifolia, *Wight Ic. non Retz.*

Western Ghats; from the Konkan to Travancore, ascending to 8,000 ft.

22. **I. Lawii**, *Hk. f. & Thoms.; Fl. Brit. Ind.* i. 448.

Western Ghats; the Konkan and Kanara.

23. **I. oppositifolia**, *Linn.; Fl. Brit. Ind.* i. 448. I. rosmarinifolia, *Retz., non Wight.* See p. 34.

Western Ghats, from the Konkan to Travancore and Trichinopoli. Also in Ceylon and Burma.

24. **I. tomentosa**, *Heyne; Fl. Brit. Ind.* i. 449.

Western Ghats; from the Southern Konkan? to Travancore, alt. 5,000-8,000 ft.

25. **I. Dalzellii**, *Hk. f. & Thoms.; Fl. Brit. Ind.* i. 449.

Western Ghats; the Konkan alt.?

26. **I. concinna**, *Hk. f.; Fl. Brit. Ind.* i. 449.

Western Ghats; loc.?

27. **I. Gardneriana**, *Wight Ic.; Fl. Brit. Ind.* i. 445. I. setosa, *Hk. f. & Thoms.; Fl. Brit. Ind.* l.c.

Western Ghats; Nilgiri Hills, alt. 1,500-5,000 ft.

§ 4.

28. **I. Leschenaultii**, *Wall.; Fl. Brit. Ind.* i. 450.

Western Ghats: Nilgiri and Palni Hills, alt. 7,000-8,000 ft.

29. I. latifolia, *Linn.; Fl. Brit. Ind.* i. 450, *excl.* I. cuspidata, *W. & A.*

Western Ghats; from the Konkan to the Palni Hills, ascending to 8,000 ft.

30. I. cuspidata, *Wight;* I. latifolia *in part, Fl. Brit. Ind.* i. 450.

Western Ghats; Nilgiri Hills, alt. 5,000-7,000 ft.

31. I. floribunda, *Wight;* I. flaccida *in part, Fl. Brit. Ind.* i. 456.

Western Ghats; from the Nilgiri Hills, alt. 6,000-7,000 ft., to Travancore.

32. I. lucida, *Heyne; Fl. Brit. Ind.* i. *excl. syn.* I latifolia.

Western Ghats; South Kanara and Travancore.

33. I. pendula, *Heyne; Fl. Brit. Ind.* i. 455.

Western Ghats; South Kanara.

34 I. mysorensis, *Roth; Fl. Brit. Ind.* i. 456.

Western Ghats; Mysore.

35. I. Balsamina, *Linn.; Fl. Brit. Ind.* i. 453. See also pp. 7, 19, 32, and appendix to this Part of the Epitome.

Throughout the Deccan Peninsula in hilly districts—All Eastern India, China and Malaya. The Peninsular forms of this species present such great differences that in an appendix, p. 49 to this Part of the Epitome I have attempted to discriminate the most remarkable of them, premising that I have no confidence in the stability of their characters.

36 I. scabriuscula, *Heyne; Fl. Brit. Ind.* i. 454.

Western Ghats; from S. Konkan to the Nilgiri Hills, alt. 6,000 ft.

37. I. flaccida, *Arn.; Fl. Brit. Ind.* i. 457, *excl.* Bot. Mag. t. 5,625, etc.

S. Western Ghats; Travancore. Also in Ceylon.

38. I. dasysperma, *Wight; Fl. Brit. Ind.* i. 457.

S. Western Ghats; Travancore.

39. I. pulcherrima, *Dalz.; Fl. Brit. Ind.* i. 458.

Western Ghats of the Konkan and Mysore.

40. I. Talboti, Hk. f. n. sp.

Western Ghats; Devimona Ghat, N. Kanara, alt. 2,000 ft.

§ 5.

41. I. Munronii, *Wight; Fl. Brit. Ind.* i. 456.

Western Ghats; Nilgiri Hills, alt. 5,000-6,500 ft.

42. **I. Hensloviana,** *Arn.; Fl. Brit. Ind.* i. 458.
S. Western Ghats; Travancore and Tinnevelli Hills, alt. 2,000-7,000 ft. Also in Ceylon.

§ 6.

43. **I. grandis,** *Heyne; Fl. Brit. Ind.* i. 463. I. Hookeriana, *Arn.; Fl. Brit. Ind.* l. c.
S. Western Ghats; Travancore and Sivagiri Hills, alt. 6,000 ft. Also in Ceylon.

44. **I. fruticosa,** *DC.; Fl. Brit. Ind.* i. 459.
Western Ghats; from the Nilgiri Hills to Travancore, alt 5,000-6,000 ft.

45. **I. viscida,** *Wight; Fl. Brit. Ind.* i. 462.
S. Western Ghats; Madura, Palni Hills, alt. 5,000-7,000 ft.

46. **I. campanulata,** *Wight; Fl. Brit. Ind.* i. 463.
Western Ghats; from the Nilgiri to the Palni and Anamalai Hills, alt. 6,000-7,000 ft.

47. **I. disotis,** *Hk. f.* n. sp.
S. Western Ghats of Travancore and Tinnevelli Hills, alt. 4,000 ft.

48. **I. verticillata,** *Wight; Fl. Brit. Ind.* i. 452.
Western Ghats; Cochin to Travancore, alt. 3,000 ft.

49. **I. Goughii,** *Wight; Fl. Brit. Ind.* i. 452. I. anamallaiensis and I. pulniensis, *Bedd.*
Western Ghats; from the Nilgiri Hills to Travancore, alt. 5,000-8,000 ft.

50. **I. viscosa,** *Bedd.; Fl. Brit. Ind.* i. 453. I. Ballardi, *Bedd.*
S. Western Ghats; Travancore Hills, alt. 3,600-7,000 ft.

51. **I. omissa,** *Hk. f.* n. sp.
S. Western Ghats; Travancore and Madura Hills, alt. 6,000, 7,000 ft.

52. **I. parvifolia,** *Bedd.; Fl. Brit. Ind.* i. 453.
S. Western Ghats; Travancore and Anamalai Hills, alt. 8,000 ft.

53. **I. cordata,** *Wight; Fl. Brit. Ind.* i. 442. I. leptura, *Hk. f.; F Brit. Ind.* i. 467.
S. Western Ghats; Travancore, Anamalai and Sivagiri Hills, alt. 5,500 ft.

54. **I. uncinata,** *Wight; Fl. Brit. Ind.* i. 465.
S. Western Ghats; Travancore Hills.

55. **I. elegans,** *Bedd.; Fl. Brit. Ind.* i. 465.
S. Western Ghats; Anamalai and Travancore Hills, alt. 3,500-5,000 ft.

56. **I. umbellata,** *Heyne; Fl. Brit. Ind.* i. 461.
S. Western Ghats; Travancore Hills, alt. 1,000-4,000 ft.

57. **I. travancorica,** *Bedd.; Fl. Brit. Ind.* i. 464.
S. Western Ghats; Travancore Hills, alt. 4,000-5,000 ft.

§ 7.

58. **I. maculata,** *Wight; Fl. Brit. Ind.* i. 465.
S. Western Ghats; Sivagiri Hills, Travancore, alt. 4,000-7,000 ft.

59. **I. phœnicea,** *Bedd.; Fl. Brit. Ind.* i. 466.
S. Western Ghats; Palni Hills, Tinnevelli, alt. 6,000-7,000 ft.

60. **I. Wightiana,** *Bedd.; Fl. Brit. Ind.* i. 467.
S. Western Ghats; Anamalai Hills, Travancore, alt. 4,500-5,000 ft.

61. **I. Tangachee,** *Bedd; Fl. Brit. Ind.* i. 467.
S. Western Ghats; Anamalai Hills, Travancore, alt. 5,000-7,000 ft.

APPENDIX.

An attempt to diagnose the principal Peninsular forms of Impatiens Balsamina, Linn. *see* p. 47.

A. Leaves usually crowded, 3-8 in. long.

I. Balsamina proper; leaves lanceolate or oblanceolate; flowers subsolitary, spur of lip much longer than the limb: I. Balsamina, *var* vulgaris, *W. & A.; Fl. Brit. Ind.*, i. 454. I. cornuta, *Linn.* I. coccinea, *Sims.*—Widely distributed in tropical E. Asia.

var. longifolia, *W. & A.;* leaves shorter linear-lanceolate, flowers usually fascicled smaller, fruiting pedicels short usually decurved, spur of lip slender, capsule small few-seeded. I. longifolia, *Benth.*—Nilgiri Hills, Madura.

var. rosea, *Hk.f.; Fl. Brit. Ind.* i. 454; leaves linear-lanceolate, pedicels 2-3-nate, flowers rather large, spur of lip shorter than the limb, strongly incurved. I. rosea, *Lindl.* I. Balsamina, *var.* brevicalcarata; *T. Cooke.*—Mahableshwar Hills; Godavery district at Samulcotta.—Also in Himalaya.

B. Leaves scattered, gradually smaller upwards, uppermost often brateiform, petiole of lower very slender, inflorescence pseudo-racemose, pedicels solitary or 2-nate very slender.

var. gracillima, *Hk. f.;* leaves 2-3 in. long ovate, flowers small, dorsal spur of standard large membranous, spur of lip very slender, capsule small minutely pubescent, seeds large.—Cuddapa district, alt. 2,000 ft.

var. racemifera, *Hk. f.*; leaves 3-4 in. lanceolate or linear-lanceolate rather thick, flowers rather large, standard narrowly winged dorsally shortly spurred, spur of lip long slender, capsule pubescent, seeds small.—Travancore; Palni and Anamalai Hills

C. Leaves scattered distant ovate or ovate-lanceolate, lower petioles long slender, pedicels solitary or binate very slender, flowers rather small, standard stoutly spurred dorsally, spur of lip very slender, capsule small gibbously ovoid acute, its tomentum caducous.

var. parusnathica, *Hk. f.*—Chota Nagpur, on Parusnath, alt. 4,000 ft.; Godavery gorges; Hazaribagh, alt. 1,500 ft. (leaves smaller, pedicels shorter).

D. Leaves crowded narrowly linear, subspinulously serrulate, stiff and black when dry.

var. linearifolia, *Hk. f.*; stem robust or slender, leaves 2-3 in. long nerves obscure, pedicels usually solitary, spur of lip long slender, seeds small.—Nilgiri, Palni and Anamalai Hills, alt. 5,000 ft.

E. Leaves very small 1-2 in. long, pedicels solitary or binate short.

var. micrantha, *Hk. f.*; *Fl. Brit. Ind.* i. 454; stem short fastigiately branched, leaves ovate oblong or obovate faintly crenulate, flowers small, sepals very minute, spur of lip long slender, seeds very small $\frac{1}{20}$-$\frac{1}{16}$ in. diam.—South Kanara and Kurg.

var. macrantha, *Hk. f.*; *Fl. Brit. Ind.* i. 454; stem short simple very slender, leaves few subsessile ovate to ovate-lanceolate serrulate, flowers 1 in. broad, sepals very minute with a stout terminal cusp or awn, standard, oblately obcordate, spur of lip short slender incurved.—Mysore. Probably a starved form.

var. arcuata, *Hk. f.*; *Fl. Brit. Ind.* i. 454; dwarf, stem decumbent or ascending, leaves ovate-lanceolate or linear-oblong subsessile, flowers smaller, sepals aristately acuminate, standard orbicular dorsal spur subterminal, spur of lip short stout incurved, capsule small, seeds few small. I. arcuata *Benth. Wight & Arn.*—Mysore, the Wynaad, Bangalore.

var. agrestis, *Hk. f.*; stem stout much branched leafy, leaves small subsessile ovate obtuse thick, flowers small, sepals very minute obtuse, standard orbicular, spur of lip stout incurved.—Abundant colouring ploughed fields in the Satara district; eaten by animals. Probably varies greatly from above description of single specimen.

V.—Species of Ceylon.

The Ceylonese species of *Impatiens* are so well described by Mr. Trimen in his "Handbook of the Flora of Ceylon" (i. 200) published in 1893, that little remains to be added to his descriptions for the purpose of identification. Having, however, examined critically the materials in the Kew Herbarium, I venture to propose for a Key to species a rather more natural arrangement than that followed in the

Handbook, to restore the *I. bipartita** of Wight and Arnott, which in that work is (following Thwaites) referred as a variety to the Malabar *I. cuspidata*, W. & A. and in the Flora of British India to *I. flaccida*, Arn. Also I have, following Beddome, referred *I. Hookeriana*, Arn., to the Malabar *I. grandis*, Heyne.

All the Ceylon Balsams, 21 in number, like those of Malabar and of the Malayan Peninsula, belong to the division of the genus with short capsules turgid in the middle; fifteen are endemic, but for the most part allied to Malabar congeners; to which latter region the remaining six belong, namely, *I. acaulis*, *oppositifolia*, *Balsamina*, *Hensloviana*, *flaccida* and *grandis*, of which *I. oppositifolia* is also found in Burma, and *I. Balsamina* is widely distributed over various warm parts of India and Eastern Asia. Except *I. acaulis*, no Ceylon species presents any abnormal character, such as the 4 sepals of various Himalayan and Burman species, or the filiform development of the dorsal auricle of the wings descending into the spur of the lip, which occurs in species of the E. and W. Himalayan regions, Burma and Malabar.

Key to the Ceylon species.

§1. Leaves and scapes radical from a tuberous rootstock; flowers racemed; bracts persistent; sepals small; seeds minute, clothed with spiral hairs . . . . . 1. *I. acaulis*, Arn.

§2. Leaves all opposite; flowers 1-3-nate on axillary ebracteate pedicels; sepals linear; seeds orbicular, glabrous, shining, black . . . 2. *I. oppositifolia*, Linn.

§3. Leaves all alternate; flowers on axillary pedicels; seeds glabrous except in *I. macrophylla*

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* I. bipartita, *Arn. in Hook. Comp. Bot. Mag.* i. 322; *Walp. Rep.* Vol. i. 468.

I. latifolia, Linn., *var. bipartita, Hk. f. & Thoms. in Journ. Linn. Soc. Bot.* iv, 124.

I. flaccida, *Arn. in part; Fl. Brit. Ind.* i. 457.

I. cuspidata, *var.* bipartita, *Thw. Enum*, p. 14; *Trim. Handb.* i, 203, *excl. Syn. Bot. Mag.* t. 5625.

I. serrata, *Moon., Cat.* 18 ? *ex. Trim* l. c.

Differs from *I. cuspidata*, Wt. and Arn. of Malabar in wanting the glaucous waxy covering of stem and branches and in the glabrous costa of the leaves beneath.

Capsule tomentose or pilose:
Annual:—
Leaves linear or oblong-lanceolate . . . 3. *I. Balsamina*, Linn.
Leaves ovate, stem erect . 4. *I. truncata*, Thw.
Leaves ovate or orbicular, stem creeping . . 5. *I. repens*, Moon.
Perennial:—
Flowers large, spur of lip very long . . . 6. *I. Hensloviana*, Arn.

Capsule glabrous:
Seeds glabrous:
Lobes of wings very unequal:
Fruticose, sepals lanceolate . . . . 7. *I. bipartita*, Arn.
Annual, sepals minute . 8. *I. glandulifera*, Arn.
Lobes of wings subequal:
Flowers large, standard 2-lobed:
Lip saccate, spur long 9. *I. flaccida*, Arn.
Flowers small, standard obcordate:
Lip cymbiform, spur long or short . 10. *I. leptopoda*, Arn.

Capsule lanate with simple (not spiral) hairs:
Stem very stout annual, leaves large, wings minute, spur of lip didymous . 11. *I. macrophylla*, Gardn.

§ 4. Leaves alternate; flowers racemose or subumbellate
Seeds glabrous:
Bracts caducous:
Suffruticose; flowers few, very large, spur very long 12. *I. grandis*, Heyne.

Bracts persistent:

Perennials, flowers racemose:

Lip very small, spur very slender . . . 13. *I. elongata*, Arn.

Lip deeply saccate, spur very short . . . 14. *I. Walkeri*, Hook.

Annuals, stem simple:

Lip infundibular, tip of spur involute . . 15. *I. cornigera*, Arn.

Lip with spur tubiform . 16. *I. Arnottii*, Thw.

Seeds covered with long spiral hairs:

Spur long, slender:

Stem simple, leaves few, lip saccate . . . . . 17. *I. janthina*, Thw.

Stem branching, leaves many, lip cymbiform, spur long or short . . . 18. *I. subcordata*, Arn.

Spur very short (see also *I. subcordata*), stem simple.

Leaves narrow, spur short inflated:—

Lip cymbiform, leaves subverticillate . . 19. *I. leucantha*, Thw.

Lip cupular, leaves crowded . . 20. *I. linearis*, Arn.

Leaves broad scattered, lip scaphiform . 21. *I. appendiculata*, Arn.

VI.—Species of the Malay Peninsula south of Burma.

The paucity of species in the above region is a most remarkable feature in the phytogeography of Indian Balsams, only 7 having been discovered in it; a strange contrast to Burma north of it where Balsams abound. This limitation is emphasized by the fact that not a single species is common to these two regions. The features and natural history of the 300 miles of country intervening between Southern Burma and the province of Wellesley in the Malay States being unknown, it is impossible to conjecture where this break in the continuity of the genus is situated, nor whether it is abrupt or gradual.

The Malayan States Balsams are all endemic, and all belong to the division of the genus with short capsules turgid in the middle. Two only are related to Burmese, namely, *I. Griffithii*, to the widely distributed *I. chinensis*, and *I. macrosepala* to *I. Parishii*. *I. mirabilis*, the most anomalous of the whole genus in the prodigious bulk of its stem and in its branching raceme, has been found on only one islet of the Langkwani group on the coast of the Wellesley Province, growing upon knife-edged limestone rocks. *I. Balsamina* which inhabits all other parts of warmer India, is not found in the Malay States except in cultivation. It is regrettable that materials are wanting for describing the Balsams of the botanically rich island of Penáng. There are in the Kew Herbarium sketches or fragments of several, but these are insufficient for identification They appear to differ from any of the described State's species, as might be expected from the fact of Penang being of granitic formation, and all the State's ones except *I. Griffithii* (which inhabits swampy land at a considerable elevation) being confined to limestone.

Sumatra is much richer in Balsams than are the Malay States. Its species are almost without exception endemic.

The collectors in the Malay States who have contributed materials or the following sketch of its Balsams, are primarily the late Mr. Curtis, Director of the Botanical Gardens and Forest Department of Penang; Griffith, Maingay, L. Wray, Father Scortechini, a collector sent to Perak by Sir G. King, and Mr. Ridley, Director of the Botanic Gardens of Singapore.

Key to the species.

(All belong to the series with short capsules turgid in the middle.)

Inflorescence racemose or panicled, pedicels bracteate at the base:—
  Stem enormously stout, sepals 2, spur short . . . . . 1. *I. mirabilis*, Hk. f.
Inflorescence of axillary pedicelled flowers, pedicels ebracteate or bracteate at the base only.
  Sepals 2:
    Lower leaves opposite or very rarely alternate, upper usually 3-5-nately whorled, spur of lip very long:
      Stem simple, leaves very narrow 2. *I. Griffithii*, Hk. f. & T.

Stem branching ·
Leaves broadly ovate, very membranous, standard obcordate . . . . . 3. *I. Curtisii*, Hk. f.
Leaves ovate-lanceolate thick, standard orbicular . . 4. *I. Wrayii*, Hk. f
Leaves all alternate, spur of lip very short:
Leaves broadly ovate, sepals shorter than the lip, spur of lip incurved . . . . 5. *I. Ridleyi*, Hk. f.
Leaves ovate—lanceolate, sepals very large, overlapping the lip, spur a didymous boss . . 6. *I. macrosepala*, Hk. f.
Sepals 4, outer broadly oblong, inner narrow :—
Stem simple naked below, spur of lip short stout incurved . . 7. *I. Scortechinii*, Hk. f.

OBSERVATIONS AND LOCALITIES.

1. I. mirabilis, *Hk. f. Bot. Mag.* t. 7195; King in *Journ. Beng. As. Soc.* lxii, II (1895) 203; *Kew Bulletin*, 1892, p. 187.

Langkwani Isld.; Straits of Malacca, 6°·20 N. on sharp pointed lime-stone rocks, *C. Curtis*, No. 1678.

By far the most remarkable species of the genus, forming a branching stem 5 ft. high and 22 in. in diameter at the base, with deciduous leaves 6-10 in. long, and a raceme branched at the base, hence paniculate.

2. I. Griffithii, *Hk. f. & Thoms. in Journ. Linn. Soc.* Bot. vi (1860), 120; *Fl. Brit. Ind.* i. 445; *King in Journ. Beng. As. Soc.* lxii, II (1893) 203.

Malayan Peninsula; Mt. Ophir, alt. 3,000-5,000 ft. *Griffith*, etc. Kedah Peak, Gunong Ledang, Gunong Mering, *Ridley*.

A near ally of the Indian and Chinese *I. chinensis*, to which some specimens collected by Griffith were erroneously referred in Fl. Brit. Ind. The leaves are very rarely ovate.

3. I. Curtisii, Hook. f. n. sp.

Malay Peninsula; Perak, Maxwell hill, *L. Wray Jn.* n. 672; alt.

4,000 ft., *Curtis*, n. 1348; *Scortechini* n. 412*a*, 1444; Larut, *King's collector* n. 6397; Gunding Hija, *Ridley.*

4. **I. Wrayi,** *Hk. f.;* n. sp.

Malay Peninsula; Perak, upper part of the Padang valley, on rocks in the river, *L. Wray* Jr. n. 1443.

Specimens very poor.

5. **I. Ridleyi,** *Hk. f.;* n. sp.

Malay Peninsula; Batu Caves, Selangor, *Ridley* n. 8278; Perak, *Curtis* (Herb. Ridley).

6. **I. macrosepala,** *Hk. f.;* n. sp.

Malay Peninsula; Perak near Ipok, and Kasoom, on limestone rocks, *Curtis*, n. 3172, 3217.

Specimens described barely sufficient.

7. **I. Scortechinii,** *Hk. f.;* n. sp.

Malay Peninsula; Perak, in limestone rocks, alt. 300 to 500 ft. *King's collectors;* Sungit Seput, *Curtis*, n. 3115, *Scortechini*, n. 1582, 1883.

ADDENDA, CORRIGENDA, ETC.

P. 3, line 3 from bottom, *for* East *read* West.

P. 4, line 5 from bottom, *for* panicled *read* fascicled.

P. 5, line 3 *after* spurred *enter in brackets* (or muticous in *I. Thomsoni*).

P. 5, line 23 *after* ovate *insert* obtuse acute or cuspidate.

P. 5, after line 23 enter as paragraph

Capsules erect, racemes elongate not interrupted, sepals orbicular or broadly ovate awned . 7/1 *I. Duthiei*, Hk. f.

P. 8, line 15 from bottom, *before* 8, *I. Lemanni, insert*

7/1 *I. Duthiei*, Hk. f.; n. sp.

Kumaon; Nangling on the Dhauli river, alt. about 9,000 ft. *Inayat-Khan.*

Nearly allied to *I. bicolor*, but racemes not interrupted. The pedicels not being fascicled or umbelled, the bracts and sepals larger, membranous and long-cuspidate. The leaves are of a singularly membranous consistence.

P. 9, line 5, *for* caphiform *read* scaphiform.

P. 10, line 16, *I. brachycentra* is a native of Soongaria.

P. 10, line 4 from bottom, *I. serrata* extends eastward to Central Nepal and Sikkim.

P. 11, line 13 from bottom, *for* 1826 *read* 1820.
P. 12, line 5, *for* Western *read* Eastern.
P. 12, line 15, *for* in *read* on.
P. 14. Replace lines 11 to 14 inclusive by:

Leaves ovate, lip saccate:
Leaves 6-10 in. crenate . . 15. *I. bicolor*, Royle.
Leaves 3-5 in. serrulate . . 16. *I. nepalensis*, Hk. f.

Leaves ovate 1-1½ in. crenate, lip tubiform . . . 16/1. *I. tubifer*, Hk. f.
Leaves 3-4 in. lanceolate serrate, lip infundibular . . . 17. *I. insignis*, Wall.

P. 15, line 20 from bottom, *after* "lip" and *before* horizontal *insert* (*b*) of expanded flowers.
P. 16, line 16 from bottom, *before* "expanded" *insert* "lip of".
P. 18, line 6 from bottom, *delete* "f." *after* "Hook."
P. 20, line 4, for "*nepalensi*" read "*nepalensis*."
P. 20, after line 5 *insert*—
16-1 *I. tubifer*, Hk. f. n. sp.
Sikkim; on Tonglo, alt. 9,000 ft. *J. S. Gamble.*
P. 22, *dele* "§" *before* 55.
P. 23, last line, *for* "63" *read* "64."
P. 24, first line, *for* "57" *read* "60."
P. 26, line 6, *for violæfloræ* read "*violæflora*."
P. 26, line 10 from bottom, *insert* a dagger (†) *before* "Basal" and in 8 from bottom an α before "stem."
P. 27, line 17, *insert* β *before* "stem petioles, etc."
P. 27, line 6 from base, *insert* two daggers (††) before "Basal."
P. 28, line 11, *insert* "or" *between* "opposite" and "alternate."
P. 28, line 13, *insert* "of" *before* "solitary."
P. 28, line 17, *insert* a dagger (†) *before* "Seeds."
P. 28, line 18, *insert* an α *before* "Peduncle."
P. 28, line 25, *insert* a β *before* "Peduncle."
P. 28, line 7 from bottom, *insert* two daggers (††) *before* "Seeds."
P. 28, line 5 from bottom, *insert* an α *before* "Leaves."
P. 29, line 5, *insert* β *before* "Leaves."
P. 30, line 19 from bottom, *before* "Himalaya" *insert* "Eastern."
P. 34, line 5, (after 28 I. chinensis) *insert* Var. ecalcarata *Hk.f.*; *I.* Ecalcarata, *Coll. & Hemsl.* in Journ. Linn. Soc. Bot **xxviii.** 30, f. 4.

Descriptions of the following species of Indian Balsams, by Professor Turczaninow, are published in the Bulletin of the Moscow Society of Naturalists, but they are not sufficient to enable me to identify them with those enumerated in this Epitome :—

I. circaeoides,	Turcz.	in Bull.	Soc. Nat.	Mus.	xxxvi	(1863)		4772.
I. clavicornu,	,,	,,	,,	,,	xxxii	(1859)	I.	271.
I. debilis,	,,	,,	,,	,,	,,	,,		,,
I. eriantha,	,,	,,	,,	,	,,	,,		270.
I. lineata,	,,	,,	,,	,,	,,	,,		271.
I. Lobbiana	,,	,,	,,	,,	,,	,,		270.
I. Perrottetii	,,	,,	,,	,,	xxxvi	(1863)	I.	394.
I. salicifolia	,,	,,	,,	,,	xxxii	(1859)	I.	2712.
I. semiverticillata	,,	,,	,,	,,	xxxvi	(1863)	I.	594.

The two following species described by Griffith are irrecognizable :—

I. assamensis, Griff. Not. Plant. Asiat. iv 459 ; Ic. Pl. Ind. Or. t. 576, f. I. The description and plate are irreconcileable.

I. malayensis, Griff. l. c. 457 ; Ic. t. 576, f. 2, from Mergui, is possibly a form of *I. Balsamina,* L.

G. I. C. P. O.—No. 2 D. B. S. I.—31-5-1906.—450—H. R.

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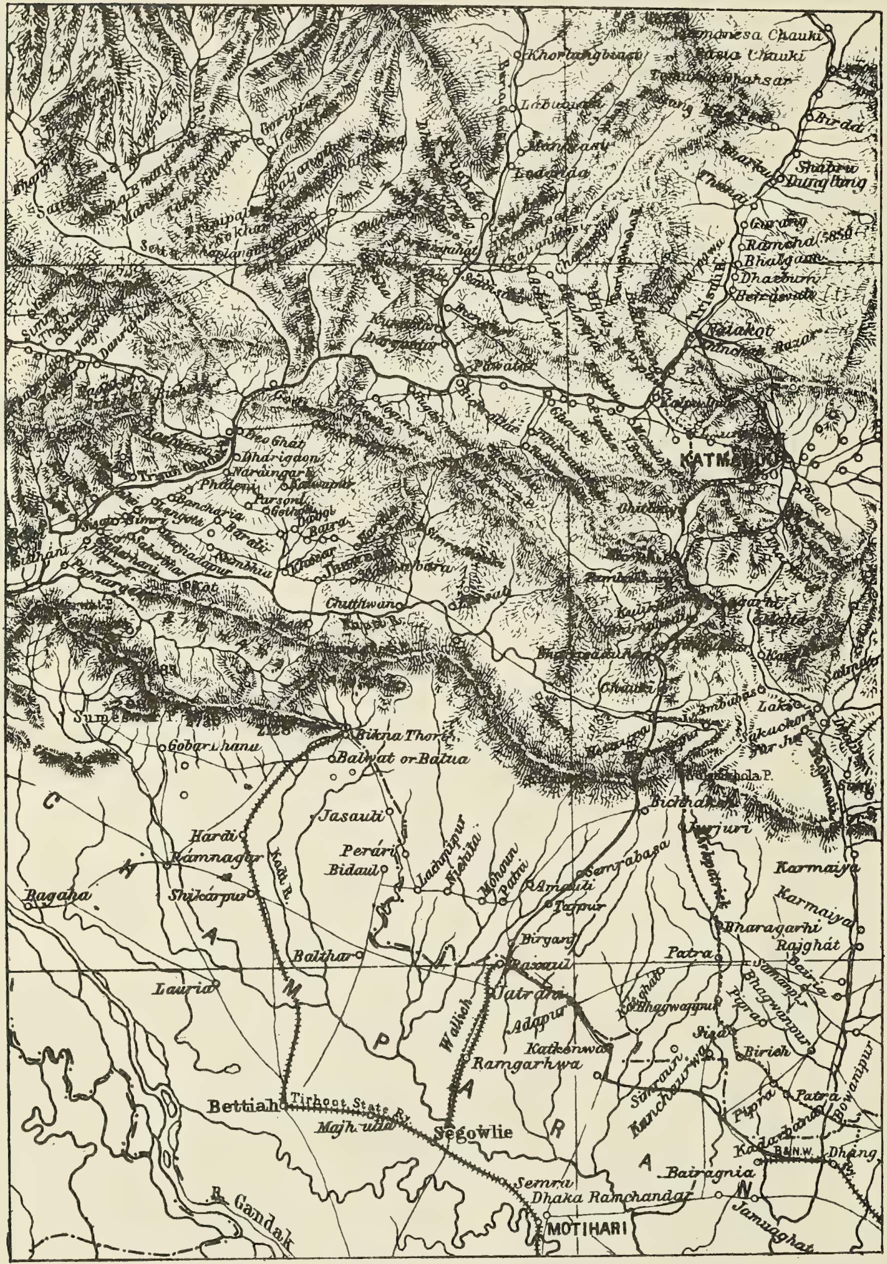
"NOTES FROM A JOURNEY TO NEPAL," Vol. IV, No. 4,

Rec. Bot. Surv. Ind. By I. H. Burkill



REG. NO. 2873 E.'10 H. 500

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MILES 10 5 0 10 20 30 40 MILES

EXPLANATIONS:—AUTHOR'S ROUTE, THE CONTINUOUS RED LINE: KIRKPATRICK TRAVELLED INTO NEPAL THROUGH THE TERAI OVER THE DOTTED LINE AND FROM CHITLANG TO NAIAKOT OVER THE DOTTED LINE: HE RETURNED BY THE AUTHOR'S ROUTE THROUGH PHARPING. HAMILTON'S ROUTE WAS THE AUTHOR'S EXCEPT FOR THE FIRST TWENTY MILES. WALLICH ENTERING THE TERAI FROM SEGOWLIE, TRAVELLED OVER THE AUTHOR'S ROUTE.

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BY

I. H. BURKILL

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NOTES FROM A JOURNEY TO NEPAL.

By I. H. Burkill.

ON November 28th, 1907, after marching along nearly one hundred miles of the Nepalese frontier between Jáinagar and Raksál, I turned, with the permission of the Nepalese Darbar, into the kingdom of Nepál and reached Khátmándu by the usual route on December the second. Thence with my kind friend, Lieut.-Colonel J. Manners-Smith, V. C., the Resident, I visited the Trisuli valley, in the neighbourhood of Niakot.

I returned from Nepál to the plains by a route through Pherphing, which diversifies the first seventeen miles of the way.

The writer collected at the same season as Wallich.

My dates almost coincide seasonally with the dates of Wallich's march to Khátmándu, and we seem, he and I, to have gathered at a period 87 years apart the same plants in the same spots.

There is no clear record left of Wallich's wanderings ; but from E. Gardner's letters to him preserved in the Royal Botanic Gardens, Calcutta, and from dates on the labels of the first plants which he collected in the kingdom of Nepál it is evident that he was at Parsua in the terai at the edge of the forest on or about December the 12th, 1820, at Chessapáni on the 18th, at Thánkot on the 20th, and at the British residency on December 21st. There he remained until about November 7th, 1821, visiting, perhaps, only one place outside the Nepál valley, *viz.*, Niakot, but persuading pilgrims to bring back curiosities to him when they went to Gossáin Thán.

On his return march he reached Bichiakoh on the 11th or 12th of November, and was at Patna on the 22nd.

I was encamped at Parsua on the night of November 28th. I returned through Parsua on December 15th, and I spent the nights of November 30th and December 14th at Chessapáni.

It is ill gleaning for novelties after a botanist with the keenness of Wallich: so I got no more than three species of *Impatiens* and apparently one *Eriocaulon*.

However, what I can, and propose to do, in the following pages is to present a little information upon the features of the vegetation.

The plants collected have been named in scanty leisure hours scattered over two years, by comparison at the Royal Botanic Gardens, Calcutta, except the species of *Impatiens*, which were kindly named by Sir Joseph Hooker. For help in various ways I wish to record my thanks to him and to Lieut.-Colonel D. Prain, Lieut.-Colonel J. Manners-Smith, Major A. T. Gage and Mr. W. W. Smith. Further my best thanks are given to Mr. C. Gilbert Rogers of the Indian Forest Service whose knowledge of the forests of Sikkim and Dehra Dun has been freely put at my service.

The belts of vegetation that the road enters.

The vegetation of the Himalaya has been classed altitudinally by Brandis, and the classification accepted by Drude (*vide* Drude et Poirault, Manuel de Géographie Botanique, pp. 451—453), thus :—(i) alpine belt ; (ii) temperate forest belt ; (iii) subtropical forest belt ; and (iv) tropical forest belt. The third belt may well be called the cultivation belt, because all along the Himalaya cultivation is most intense in it, and more distinctly cuts off the upper forests from the lower forests than any other feature. It is indeed very convenient to use this intenser cultivation as an aid in defining the vegetative belts.

I shall now state which parts of the road from British India to Nepál are in the tropical forest belt, the cultivation belt and the belt of temperate forests.

The road from the plains up to Bhimpedi is in the tropical forest belt. It strikes the forest some fourteen miles from the British border, penetrates it to the foot of the Chorea Gháti hills, crosses the Chorea Gháti by the Bichiakoh pass, and descends slightly to Hettáunda, which is in the *mári*, *i.e.*, *dun* or open valley of the Rápti river ; thence entering a gorge it climbs gently by Bháinsa-duhán and Pánrán to the head of the valley, where detritus has created a small gravel plain. On the plain is Bhimpedi and just under it Mákápáká. At Bhimpedi a very steep ascent begins ; and the road lies in the cultivation belt ; but the hill side up which the path goes is too steep for crops, and only a small area bearing them is seen just below the village ; however some miles away to the east there is extensive cultivation. The fort of Sisagárhi is near the top of this hill ; and above it, about the Chessapáni pass at 6,000 feet, the road reaches the first bit of hill-forest, the trees at the pass itself being festooned as on the wet ridges of Sikkim with mosses. From the pass the road goes down again into the cultivation belt and winds by the river Pinouni through the cold valley of Lohári Nepál, past Támbeh Kháni to Márkhu at 4,500 feet ; thence it ascends over downs to Chitlong and so once more into the temperate forest belt. In this belt it climbs to 6,800 feet, to a pass on the hills called Chándagiri, whence the traveller sees like a map spread out below, the wide valley of Nepál with its three cities, and many towns and villages. The irregularities of the broad valley are not large and are little noticeable from this height: we see only a ring of wooded hills* on one part of which we stand, and below a wide stretch of cultivation with here and there a town or city and here and there a small patch of woodland.† I was allowed to cross this ring of hills at four places, (*i*) by Pherphing, (*ii*) by the Chándagiri pass, (*iii*) by Kakni, and (*iv*) by the Sángli khola: as already said, none of the passes crossed are of any height; but visiting them gave me some slight acquaintance with the variety of vegetation existing. I left the valley, when returning to the plains, by Pherphing; I travelled to Niákot by Kakni and returned by the Sángli khola.

Niákot stands at about 3,000 feet on a hill crest between the junction of the Tádi and Trisuli rivers. The town itself is in the cultivation belt, but the valleys, which are 1,000 feet below, are in the belt of the tropical forests. They are full of crops of rice and sugarcane, and contain sál forest. The rices are the rices of the terai, and not the hill rices of Nepál proper; they are reaped in December just like those of northern Champáran and Darbhanga:— indeed they are for a large part identical ‡.

The use of two local words— 'biási' and 'tár' is well exemplified in the valleys under Niákot. A biási is a low flat place irrigated generally; a tár is a place which can not be irrigated and so produces rain-crops only. The snow-river Trisuli rushes down a narrow valley past Niákot under cliffs; and the bits of even ground above the cliffs are társ: the Likhu and Tádi fall more evenly through moderately broad flats, whither irrigation channels bring water to crops: these flats are biásis. On a cold December morning, these biásis give off a thick fog; but none rises in the Trisuli valley. The Tádi is capable in the rains of being a fierce stream: it has destroyed many bridges built over it (Oldfield, Sketches from Nepal, 1880, p. 33); and when in 1792 the Chinese and Gurkhas fought on its banks, it swept away more men than actually fell in battle. In the valleys near Niákot are some royal gardens, whence is drawn a supply of that fruit which the valley of Nepál does not produce well; I visited one at a village called Gurkháh. The plants cultivated are mentioned on page 71 forward. The court of Prwithi Nárayan was at Niákot for a time after the conquest of Nepál in 1764, while the Gurkhas were still widening their kingdom. Thither, therefore, went Kirkpatrick in 1793, as envoy from the Governor-General of India, by a road from Chitlong which he describes as ascending through stunted oak scrub (*i.e.*, much lopped *Quercus semecarpifolia*) to a crest over the Doona biási beautifully wooded with trees, just as is the crest of Chándagiri.* The old palaces can be seen still under Niákot by the Tádi: they were too low to be healthy and the court moved from the riverside up the hill, and then finally to the much more salubrious neighbourhood of Khátmándu.

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* Kirkpatrick in his *Account of the Kingdom of Nepal* exaggerates in regard to these hills. There is no call for the expression "stupendous mountain of Sheoopoori," that he uses (page 69).

† The reader should note that properly speaking, this valley is Nepál: its centre is the old temple of Khátmándu; and the kingdom which it rules is the "Kingdom of Nepál."

‡ *Cf.* Brian Houghton Hodgson's Essays, ii, page 56.

In discussing the vegetation I shall begin with the terai and I shall in no way concern myself with what is west of Bikna Thori.

The bhavar or Sál forest under the mountains.

The atlas of India does not represent correctly the limits where the open terai abuts against the "bhavar" or Sál forest on the east side of the Bágmati river, though it represents it approximately correctly on the west. It is incorrect in that it represents forest as extending to the limits of British territory whereas one must go so much nearer to the foot-hills as eight miles north of Janikpur before the edge is reached.

Roughly over this part of the country the "bhavar" or Sál forest spreads from the foot-hills for upwards of ten miles on to the plain. At Simulbása it begins very abruptly—a long wall of forest stretching east and west with cultivated fields abutting on it; and its definiteness is obviously due to cultivation. Probably this is the general condition.

The southern limits of the Sál forest in the eighteenth century and now.

I had wished in this place to discuss the age of this forest line; but there are not data enough for the purpose. This much is certain, that 125 years ago the edge of the great forest was as now near Simalbása: and it may be stated that evidence does not exist to show that it has been of much wider extent during the Christian era, though the extent of the waste lands on its borders have varied. Father Marc, who resided in Bettiah from 1758 to 1768, narrates how in his time in going from

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* He mentions (page 79 sissoo and pines as growing in the chasms under the shoulders: the first probably does not grow there: what pine the second is it would be interesting to ascertain.

Bettiah to Khátmándu one travelled through long grass for three days, and then met the forest near Parsua (*vide* Lévi, Le Népal, i, p. 123). Kirkpatrick who in 1793 passed out of Nepál by this road represents in his map the forest as ending near Simalbása and says (Account of Nepal, p. 30) "Goor pussra stands very near the skirt of the great forest; ..... the country all round the village is ...... by no means bare of cultivation". Gurparsua is a little south of Simalbása. Hamilton who followed him in 1802 found the edge of the forest "3 miles beyond Gar pasara," *i.e.*, at Simalbása.

Kirkpatrick in going to Nepál crossed the foot-hills by the Sakti-khola pass on the east of my route: he relates of it (p. 15) that the forest began just beyond Soopeah (Soophye), and this is about the spot where it begins now.

The Nepalese wars of 1814 and 1815-16, and subsequent boundary survey, resulted in a map of the terai wherein the limit of the forest is given east and west of the roads that Kirkpatrick and Hamilton had taken (*vide* Prinsep's Transactions in India, 1813-1823, vol. i, 1825, map facing p. 179). The military operations of 1814 had taken place along its edge.

The "bhavar" or forest, it may be said, is neither much deeper nor much shallower than it was a century and a quarter ago.

Patches of forest south of the Bhavar; no ground for assuming that they have been part of the Bhavar.

South of the limits of the great forest persist small areas of poor forest, isolated by wide spreads of cultivation. There is one patch at Parsua and another within British territory on the bank of the Tiur nadi south of Cháuradána. It is probable that the latter represents the forest spoken of by Firishta in connection with the capture of Semráon in 1352. This is how Firishta describes the event. "As the king (Tughluk Sháh) was passing near the hills of Tirhut, the Raja (of Semráon) appeared in arms, but was pursued into the woods. Finding his army could not penetrate them, the king alighted from his horse, called for a hatchet, and cut down one of the trees with his own hand. The troops on seeing this, applied themselves to work with such spirit that the forest seemed to vanish before them. They arrived at length at a fort surrounded by seven ditches full of water and a high wall. The king invested the place, filled up the ditches and destroyed the wall in three weeks. The Raja and his family were taken and great booty obtained." The forest encountered by the Mohammedans may well have been more extensive than the line now persisting, but could hardly have been part of the great forest; for cities as large as Semráon (2 miles square) cannot exist without cultivation round them. I am quite aware that Georgi, describing from hearsay the road from Myhsi to Makwanpur *viá* the Sakti-khola pass and referring to Semráon describes it as if it were then ruins in the middle of the great forest: but in the light of Kirkpatrick's remarks that north of Semráon in 1793, was a jungle of *Butea frondosa* infested by bears, it is evident that Georgi wrote loosely, and that Semráon was not truly in the middle of the great forest.

The waste grass lands of the terai; their want of history and migratory population.

The long grass which Father Marc mentions is the vegetative formation often spoken of as "kháraul".* Father Marc's wide stretch of kharául has now given way to almost uninterrupted tilled fields, except that one small area persists just north of Bettiah, and there are a few others elsewhere.

The kháraul south of the forest in Father Marc's time grazed large herds of cattle much bought by the East India Company as draught animals: and the fires kindled yearly by the graziers, when they returned after the rains, kept the country under grass, destroying the young trees and maintaining the forest limit definite.

It is a pity that none of the old pilgrims has left any record of the condition of this country in his times. There has been for ages a pilgrim route east of the Gandak from Vaisali or somewhere near the Ganges by the Bikna Thori pass into Nepál. Fa Hian went over part of it in the fourth century, but left no record. Sung Yun in 518 did the same. Huien Tsang gives little information; and regarding this great traveller Watters (On Yuan Chwang, in the publications of the Oriental Translation Fund, vol. xv, 1904, page 83) even doubts if he visited Nepál from Vaisali; Kusinágará, which he did visit, coming from the west and returning south-west, may have been west of the Gandak or if east of that river, must have been not nearly so far east as Bikna Thori. Wang-hiuen-tze in 648 and 657 probably crossed the Bikna Thori pass, but left no information.

West of the Gandak according to Huien Tsang were ruined cities and near them forests with insecure roads, marks of the decay of old power: it is probable that in his time the east side of the Gandak was equally in a state of decay, out of which in time rose Semráon, to fall in 1325 before a Mahommedan incursion, the country being left worse off than before.

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* Kharaul is to be distinguished clearly from darbi or thatching grass which occurs in abundant small areas up and down the country, and it to be classed under cultivation as a meadow.

The actual terai has had little history from 1325 until at the end of the eighteenth century the British raj and the new power of the Gurkhas began to rescue it from its impoverished state. It seems, through the intervening centuries, to have been almost always insecure, chiefly waste and always unhealthy—the land of the marches where the hill rulers at times had the upper hand and at times the plains rulers. Bettiah on the southern edge was the end fort of the line of forts that Husáin Sháh (1493-1518) built to keep out invasion from the north.

When in the eighteenth century history again begins to notice the terai, we find that hill rajas, *e.g.*, of places like Makwanpur, hunted in it, and contrived to levy dues, and the early missionaries complained of the exactions and annoyances of their imposts (*vide* Lévi's Le Népal, p. 120 footnote). Ivory was collected. We find too that graziers went to it when the hot weather dried up their pastures in the south and paying what was demanded to the power of the day, fired the grasses and stayed until the unhealthy rains drove them south. We find a little later that timber was cut in the forests on its northern border and exported through it for boat building on the Ganges and for beams and rafters of houses in quantity sufficient, as Prinsep says, to bring it into universal use as far as Calcutta. The migratory population of graziers, woodcutters, and hunters, persisted still in Oldfield's time (*vide* page 60 of his Sketches), though diminished.

The spread of the present state of cultivation into the terai.

It was in 1764 that the battle of Buxar made British the plains of Tirhut; and it was in 1768 that the Gurkhas captured Nepál. From these years is to be counted the change in the fortunes of the terai; and in desire to improve its conditions the court of Khátmándu has not been less anxious than the British have been south of the border. A firm rule has caused cultivated fields to extend uninterruptedly to the edge of the forest itself. How cultivation increased through northern Champáran may be judged from information to be found in O'Malley's Gazetteer of that district, 1907, page 74, and Oldfield's Sketches, page 55.

The present cultivation near the forest limit at Simalbasa is not so intense as southwards and fallows are very common, but almost all the land has been brought under the plough. Rice is the chief crop; but in December mustard is also common.

Crops and weeds of cultivation in the terai.

The weeds of the fallows and waste land at the edges of the fields are chiefly :—*Sida rhombifolia*, *Urena lobata*, *Triumfetta rhomboidea*, *Indigofera linifolia*, *Cassia Tora*, *Mimosa pudica*, *Vernonia cinerea*, *Cæsulia axillaris*, *Eclipta alba*, *Chrysanthellum indicum*, *Emilia sonchifolia*, *Hydrolea zeylanica*, *Cynoglossum lanceolatum*, *Solanum xanthocarpum*, *Scoparia dulcis*, *Rungia parviflora*, *Leucas linifolia*, *Anisomeles ovata*, *Amarantus spinosus*, *Achyranthes aspera*, *Alternanthera sessilis*, *Polygonum glabrum*, *Polygonum Hydropiper*, *Euphorbia pilulifera*, *Cyperus flavidus*, *Cyperus auricomus*, *Mariscus microcephalus*, *Fimbristylis dichotoma*, *Kyllingia triceps*, *Panicum colonum*, *Andropogon acicularis*, *Cynodon dactylon*, *Eragrostis amabilis* and *Eragrostis stenophylla*. They are all wide spread plants of the plains of India except *Chrysanthellum indicum* ; and that little plant is not of restricted distribution.

Half way between Parsua and Simalbása is a thatching-grass meadow. This meadow on examination was found to be composed of *Andropogon intermedius*, *Cymbopogon Martini*, and *Setaria glauca*, with abundant plants of *Exacum tetragonum*, *Cassia mimosoides*, and *Alysicarpus rugosus*. The thatching-grass meadows seen further south within British territory contained a different vegetation.

The plants associated in an isolated patch of forest at Parsua.

The little patch of thin forest at Parsua consists of trees of :—*Cedrela Toona*, *Lagerstrœmia parviflora*, *Bridelia retusa*, *Mallotus philippinensis*, *Trema orientalis*, *Salix tetrasperma*, and a *Tetranthera*, with a growth of small shrubs and rather tall herbs between them, *e. g.*, *Crotalaria alata*, *Desmodium gyroides*, *Pueraria phaseoloides*, *Melastoma malabathricum*, *Osbeckia nepalensis*, *Anisomeles ovata*, *Leucas hyssopifolia*, *Leonotis nepetæfolia* and *Plectranthus ternifolius*.

Here and there in the country side stand trees of *Bombax malabaricum*. Hamilton remarked that in 1802 it and *Butea frondosa* were the commonest trees of the terai. With the extension of cultivation at the expense of the tall kharául grass, they and probably also *Salix tetrasperma* have become much less abundant.

Plants of the coarse grass lands.

A study of the patches of kharául grass which remain, and a comparison with stretches existing in the Duars, will give some idea of the past vegetation. *Saccharum Narenga* in the Nepál terai is its chief species, and is associated with *Cymbopogon*

Martini and *Saccharum arundinaceum*. When fire is withheld long enough or is not fierce enough, *Bombax malabaricum* can get a hold and flourish

Appearance of the bhavár or great forest: its climbers, its two divisions.

The bhavar or level forest is not dense, and the ground under the trees is lit in November with checkered sunlight, whether the overhead canopy be of leaves of the sál (*Shorea robusta*), or of the leaves of the variety of trees which grow together south of the sál. It becomes yet more open on the Chorea Gháti hills.

Yapp has recently used the happy expression "general vegetation level" to indicate the height above the ground that an assemblage of plants in chief part attains. We have two general vegetation levels in this forest, one of the trees, and the other of the half shrubby, half herbaceous assemblage under them. As the lowest foliage of the trees is generally ten feet above the lower general vegetation level, one can look widely through the forest over the grass and shrub tops. This condition is of course exaggerated in the Dipterocarp forests of northern Burma, where one can see down aisles and avenues in all directions over quite a short undergrowth: and it is in great contrast to the tangle of creepers and shrubs of all sizes which occurs in the mixed forests on the lower slopes of the Himalaya.

Large tree-ascending creepers, except *Spatholobus*, are generally absent: small shrub-climbing creepers are very common: such are *Dioscorea dæmona, D. glabra, D. anguina, D. bulbifera, D. pentaphylla, Zehneria umbellata* and *Cissampelos Pareira*. It has seemed to me that some of the sál forests of the Darjeeling district are peculiarly full of fleshy rooted plants, such as these creepers are.

Entering the forest at Simalbása we find trees of *Bombax malabaricum, Bauhinia malabarica, Mallotus philippinensis, Adina cordifolia, Bridelia retusa, Cedrela Toona, Dillenia pentagyna, Hymenodictyon excelsum, Spondias axillaris*, and *Terminalia tomentosa*, with, below them, *Phyllanthus Emblica, Streblus asper, Randia dumetorum* and *Thespesia Lampas*. Again below on the ground is a short vegetation of the grasses, *Oplismenus compositus, Setaria glauca, Pollinia articulata, Chloris incompleta, Panicum prostratum, Eragrostis amabilis, Andropogon fascicularis, Panicum flavidum*, mixed with a *Leea*, the composites *Elephantopus scaber, Vernonia cinerea*, and *Adenostemma viscosum*, the Leguminosæ *Mimosa pudica, Crotalaria alata* and

C. calycina, the Malvaceæ *Sida cordifolia*, *S. carpinifolia*, *Hibiscus cancellatus*, and *Urena lobata*, the Tiliacea *Triumfetta rhomboidea*, *Asparagus racemosus*, *Rungia parviflora*, *Trichodesma indicum*, *Anisomeles ovata* and a plant which appears to be an *Alpinia*.

It will be noticed at once that this is a vegetation mainly composed of common weeds of India.

The sunlight gets to this vegetation the more readily in November and December because some trees are then becoming bare, *e.g.*, *Dillenia*, *Spondias axillaris*, and *Hymenodictyon excelsum.*

Where we meet with sál at Adbabhár, *Laggera flava* and *Symplocos spicata* suddenly become abundant; and nearer to the hills is plenty of *Nyctanthes Arbor-tristis.* These plants with *Antidesma diandrum*, *Vernonia teres*, and *Clausena pentaphylla* are characteristic of the sál forest.

Looking through the sál trees with one's eye at about the level of the top of the undergrowth, *Thespesia Lampas*, *Rivea ornata*, *Asparagus racemosus*, and *Grewia hirsuta* chiefly attracted notice.

The leaves of *Antidesma diandrum* in December go red. There were no other red leaves in the forest, but yellow dying leaves were plentiful.

Pine-woods of the south face of the foot hills.

The road very gently ascends through the forest to Bichiakoh at the foot of the hills and then taking to the wide shingly bed of the stream ascends the Chorea Gháti to a pass at 2,000 feet. The hills are in their lower parts of sandstone with rounded stones or above of conglomerate: they are cut into knife-edge ridges on which *Pinus longifolia*, *Terminalia tomentosa* and *Shorea robusta* (sál) grow in a loose forest out of 2-3 feet high grass. No place except the river margin is level; and late in the dry weather the well-drained slopes must be very dry; *Dalbergia Sissoo* grows along the sides of the stream and makes islands in it. On the margin of the river bed was a vegetation of some slight luxuriance, where the yellow flowers of *Reinwardtia trigyna* made a brave show; and with it were in plenty the large-flowered *Lindenbergia grandiflora*, *Saurauja nepalensis*, *Inula Cappa*, and *Leucas mollissima.* A remark which must be made regarding *Inula Cappa*, is that my specimens are exactly the *Inula eriophora* of De Candolle, which is reduced in the Flora of British India to *Inula Cappa*, but is probably a good variety. I found it plentiful over nearly the whole of the march between Bichiakoh and Hettáunda and doubtless in the very places where Wallich collected the type of *Inula eriophora.*

Osbeckia chinensis, *Crotalaria albida*, and *Meliosma simplicifolia* occur on the stream side; and the climbing *Dioscorea belophylla*, *Sabia paniculata*, *Hedyotis scandens*, *Ficus scandens* and *Thunbergia coccinea* put in an appearance.

There are further,—because carters encamp so much there,—a number of weeds dependent on man which need not be enumerated. Only the occurrence of *Artemisia vulgaris* may be mentioned, because it is interesting to see how low it, which descends to the plains of Upper Assam, can descend in this longitude.

Vegetation about the top of the foot hills, more or less 2,000 feet above sea level.

From half way up the Chorea Ghâti hills to the top of the ridge, plants not seen earlier are met with, *viz.*, *Swertia angustifolia*, var. *Wallichii*, *Æchmanthera Wallichii*, *Indigofera hirsuta*, *Maoutia Puya*, and *Bœhmeria rugulosa*; and at the top appear *Blumea obovata*, *Scutellaria repens*, *S. discolor*, *Echinacanthus longistylus*, *Anaphalis araneosa*, *Strobilanthes capitatus*, *Mussænda Roxburghii*, and *Geniosporum strobiliferum*. *Blumea obovata* was one of the most conspicuous of plants on the top of the pass, though over a restricted area: its large heads nod and it does not look at all like a *Blumea*. It was only known formerly from Wallich's specimens, probably obtained exactly whence mine came. I am indebted to the Director of the Royal Botanic Gardens, Kew, for a comparison of my specimens with the type. *Echinacanthus longistylus* was also abundant over a small area.

North slope of the foot-hills.

The descent northwards is for a very short way steep; then it becomes quite gentle, winding through open sâl forests down to the Kuró nadi near Hettáunda and on to the Rápti at Hettáunda itself. *Pinus longifolia* hardly descends these damper northern slopes; *Shorea robusta* instead rules in exactly the same positions as it does at Dehra Dun. The grasses are here taller than they were on the south side of the hills; there is abundance of *Phragmites Karka*, *Anthistiria gigantea* and a *Saccharum*: *Phyllanthus Emblica* is very common; and towards Hettáunda *Mimosa rubricaulis* lashes the shrubs together; and *Asystasia macrocarpa* grows among them. A few epiphytic orchids appear; and at Hettáunda itself Dioscoreas are vigorous.

The vale of the Rapti put out of cultivation by order.

Hettáunda is a poor hamlet, living on the trade which passes through it. The small area of land that had been ploughed was, in December, a waste of tall weeds chiefly *Ageratum, Siegesbeckia, Nicandra physaloides, Cassia Tora, Euphorbia pilulifera, E. neriifolia*, and *Jatropha Curcas*: *Bœrhaavia* sp. and *Achyranthes aspera* were present also, as followers of man. East of Hettáunda is the Makwanpur mári or vale of Makwanpur, said formerly to have been much cultivated, but now nearly all under forest; westward the forest extends down the wide vale of the Rápti getting thinner and thinner until it almost disappears. In 1815 this lower valley was reported abundantly cultivated: but now the forest is pressing in more on to Hettáunda than it used to do a century ago, when, as Hamilton, for instance, said (Account of Nepal, p. 197) " the country had few trees." The policy of the Nepalese Government after the Gurkha wars was to build a barrier of malarious forest under the hills that no invading army should there obtain a base: and without doubt the Makwanpur mári was put out of cultivation by order. It is as Oldfield says (Sketches, p. 49) that "previous to the first Nepál war, the dhuns of Chitáun and Makwanpur were extensively cultivated, but since the peace of 1816 the Gurkha Government from motives of policy has caused the inhabitants to abandon the greater part of them and they have been allowed to revert to their natural state of forest and grass jungle." Kirkpatrick had seen "abundance and great variety of rice" grown in the Makwanpur mári (Account of Nepal, p. 23). The Gurkhas had had very good reason to appreciate the value to them of the malarious forest; for in 1764 it took heavy toll from Captain Kinloch's force at Bhareh on its skirt under the Sakti khola pass.

Clematis Gouriana and *Drymaria cordata* appear at Hettáunda representing two distinctly temperate orders of plants.

Dense tangled forest of the outer face of the mountains and gorge of Bhainsi Duhan.

North of Hettáunda the hills consisting chiefly of limestones and quartzites (*vide* Medlicott in Records of the Geological Survey of India, viii, 1875, p. 95) rise abruptly to 6,000 feet and carry forest quite unlike that southwards,—dense forest with tangles of creepers, aroids, epiphytes, screw pines, etc., and having nearly the appearance of the wet forests of lower Sikkim. Where the gorge, up which the road runs, is at its deepest, the cold weather sunshine at midday hardly falls direct on the damp tangle of vegetation in hollows on the hill face towards the north and the strata are much broken and confused, great masses of the white limestone forming irregular cliffs on both hill sides.

The conspicuous large trees of this dense forest are *Duabanga sonneratioides*, *Terminalia tomentosa*, *Shorea robusta*, *Anthocephalus Cadamba*, *Bombax malabaricum*, a *Bauhinia*, and another Leguminosa, with sissoo for the first part of the way in the stream bed. At the deepest part of the gorge *Pandanus furcatus* grows; and *Rhaphidophora glauca* climbs up the tree trunks. On the hill face towards Hettáunda plants of the large creeper *Combretum decandrum* are very plentiful, just as they are where the Tista debouches on to the plains. *Dalbergia volubilis* was common in the forest, sprawling over other shrubs: a rambling *Zanthoxylum*, *Holmskioldia*, a *Vitis*, *Mimosa rubricaulis*, a *Thunbergia*, and two Menisperms are other climbers. Big ferns are plentiful, and *Selaginellas*, which in December were drying up. A bamboo with long whip-like terminations to its shoots grows in the drier parts of the forest: and so also grow in abundance *Oroxylum indicum*, *Hamiltonia suaveolens*, and *Antidesma diandrum*. *Mussænda Roxburghii* is also present: and where the rocks break through *Kalanchoe spathulata* appears. Every damp hollow is full of *Strobilanthes* covered with flowers, with *Reinwardtia trigyna*, and with *Elatostema rupestre*. Every level corner where travellers can rest for a night carries weeds associated with man, such as *Girardinia heterophylla*, *Urtica parviflora*, *Ageratum conyzoides*, and *Polygonum mite*. As we reach the upper part of the gorge *Rubus ellipticus*, *Colebrookia oppositifolia*, and *Adhatoda Vasica* appear.

In the old days the road up this gorge wound along the stream bed. Father Marc says (from hearsay) that it crossed the stream thirty-five times, and in the rains was impassable. Kirkpatrick enumerates twenty-four crossings, and Hamilton mentions twenty-two. Father Giuseppe (Asiatic Researches, ii., 1790, *p*. 307 translation by John Shore) writes of more than fifty crossings of streams on the road to Nepál half of which would be over this river.

Now-a-days a well-laid cart road runs along the east bank from Hettáunda to Bháinsa Duhán, and there it crosses by a cantilever bridge on to the other bank, to climb gently out of the tropical forest belt to Bhimpedi.

The valleys under Niakot: their cultivation and their weeds.

As said, at Bhimpedi we enter the cultivation belt, but before leaving the tropical forest region it is necessary to say something about the vegetation below Niákot. The Niákot valley is fenced off against the south wind by the line of mountains which is penetrated by the road of which we have been speaking. It is open and tilled where level. Its sides are covered with sál forests, whence the Nepál valley draws its supply of leaf-platters. The ground if low, such as is called a biási, carries rice crops : if high, such as is called a tár, was chiefly fallow in December after a crop of *Sesamum.* I imagine that the cultivation formerly existing in the vales of Chitaun and Makwanpur was similar.

An interesting account of the crops of Niákot may be read in Hodgson's Essays, ii, pp. 56-57.

Striking features of the Niákot valley are its patches of sugarcane, and its orchards of plantains, mangoes, guavas, pears, oranges, carambol, etc., and its gardens of pineapples, yams (*Dioscorea alata* Linn.), wax gourds (*Benincasa cerifera* Savi), Tapioca (*Manihot utilissima* Pohl) and various forms of *Cucumis.* Oranges grow remarkably well.

Vicoa auriculata, Evolvulus alsinoides and *Vernonia cinerea* were plentiful as weeds. *Agave Vera-Cruz* occurred. *Glossogyne, Rubus ellipticus, Euphorbia neriifolia, Zizyphus nummularia, Colebrookia, Wendlandia pendula, Holmskioldia sanguinea, Bryophyllum calycinum, Cassia Fistula, Clerodendron serratum, Calotropis procera,* and *Callicarpa macrophylla* were abundant on the conglomerate cliffs over the Trisuli. On its bank was *Ficus pyriformis* nestling among boulders ; and just above the flood-level *Gentiana decemfida, Zeuxine sulcata, Oldenlandia corymbosa, Cyperus tuberosus, Scutellaria rivularis, Fragaria indica* and *Ophioglossum vulgatum* were together.

The *Gentiana* which I examined with considerable care, exactly agrees with the type collected by Wallich, and is distinct enough from the var. *aprica* of the Punjab Siwaliks. I made a careful search for Podostemaceæ without any success.

In the rice stubble along the Tárdi valley *Oplismenus compositus, Herpestis Monnieria, Cæsulia axillaris, Eragrostis amabilis, Mariscus microcephalus,* and *Setaria glauca* were common. *Arabis hirsuta* was once seen.

Ficus lævis was seen near Gurkháh,* perhaps planted. Wallich's type of *F. Emodi*, which is this species, is labelled "towards Gossain Than" and therefore probably came from one of the valleys near Niákot, and if so from not far from Gurkháh. *Limnophila conferta* was found at Thánsing which is the extreme of its distribution towards the north-west.

Plants of the Sál forests under Niakot.

In the sál forest, *Phœnix humilis. Phyllanthus Emblica,* and *Laggera flava* were common.

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* This Gurkháh is a village about seven miles from Niákot

The Sál forest at Thánsing in the Likhu valley where it is near its upper limit contained as undergrowth an abundance of *Wendlandia coriacea*, *Hyptianthera stricta*, *Ardisia humilis*, and sheets of *Nephrolepis tuberosa.*

Pteris aquilina, *Woodfordia floribunda*, and *Schima Wallichii* thither descend so as to come into contact with the sál. Other plants associated with the sál were *Desmodium confertum*, *Celastrus paniculata*, *Heynea trijuga*, *Ficus Cunia*, *Pieris ovalifolia*, *Polygonum barbatum*, a *Strobilanthes*, *Plectranthus striatus*, *Dysophylla cruciata*, *Reinwardtia*, a *Smilax* and an *Eugenia*.

Forests of Castanopsis.

The Sál forest give place to a forest of *Castanopsis indica* both on the hill of Niákot and above Thánsing. I think that this change marks the place where the tropical forests may be conveniently considered to end.

Crops under Niákot.

Cultivation of the following crops was observed :—

Juár (*Sorghum vulgare* Pers.), Marwa (*Eleusine coracana* Gærtn.), Tapioca (*Manihot utilissima* Pohl), *Dioscorea alata* Linn., *Benincasa cerifera* Savi, *Cucurbita Pepo* DC. or *C. maxima* Duchesne. *Lagenaria vulgaris* Ser., *Amorphophallus*, Sugar-cane, *Sesamum*, Peas, *Dolichos Lablab* Linn., Tomatoes, *Mucuna pruriens* DC., *Chenopodium album* Linn., Guavas, Plantains, Jack fruit, Mangoes, Máhua (*Bassia butyracea* Roxb.), Ber (*Zizyphus Jujuba* Lamk.), Jámun (*Eugenia Jambolana* Lamk.), Pineapples, and Kamrak (*Averrhoa Carambola* Linn.).

A list of all the plants observed in the tropical Forest belt.

The following is a list of all the plants observed in the tropical forest belt. Those in Capitals were more abundant either locally or generally than the others.

Clematis Gouriana Roxb.
Clematis grewiæflora DC.
DILLENIA PENTAGYNA Roxb.
Cocculus villosus DC.
Cissampelos Pareira Linn.
Argemone mexicana Linn.
Cardamine hirsuta Linn.
Flacourtia Ramontchi L'Her.
Xylosma longifolium Clos.
Polygala leptalea DC.
BRACHYSTEMMA CALYCINUM Don.
DRYMARIA CORDATA Willd.
Polycarpon Lœflingiæ Benth. & Hook. f.
Hypericum japonicum Thunb.
Mesua ferrea Linn.
SARAUJA NEPAULENSIS DC.
SHOREA ROBUSTA Gærtn.

Sida rhombifolia Linn.
Sida carpinifolia Linn.
Sida cordifolia Linn.
URENA LOBATA Linn.
HIBISCUS CANCELLATUS Roxb.
THESPESIA LAMPAS Dalz. & Gibs.
KYDIA CALYCINA Roxb.
BOMBAX MALABARICUM DC.
Abroma augusta Linn.
GREWIA SCABROPHYLLA Roxb.
Grewia hirsuta Vahl.
TRIUMFETTA RHOMBOIDEA Jacq.
Corchorus capsularis Linn.
Corchorus olitorius Linn.
Elæocarpus Ganitrus Roxb.
REINWARDTIA TRIGYNA Planch.
Oxalis corniculata Linn.
Zanthoxylum ovalifolium Wight.
CLAUSENA PENTAPHYLLA DC.
Ochna pumila Ham.
CEDRELA TOONA Roxb.
Schœpfia fragrans Wall.
NATSIATUM HERPETICUM Ham.
ZIZYPHUS JUJUBA Lamk.
Zizyphus nummularia W. & A.
ZIZYPHUS RUGOSUS Lamk.
Vitis carnosa Wall.
LEEA sp.
Sabia paniculata Edgew.
MELIOSMA SIMPLICIFOLIA Walp.
Mangifera indica Linn.
SEMECARPUS ANACARDIUM Linn. f.
SPONDIAS AXILLARIS Roxb.
CROTALARIA PROSTRATA Roxb.
Crotalaria acicularis Ham.
Crotalaria alata Ham.
Crotalaria albida Heyne.
Crotalaria calycina Schrank.
CROTALARIA SESSILIFLORA Linn.
CROTALARIA SERICEA Retz.
Crotalaria tetragona Roxb.
Crotalaria medicaginea Lamk.
Parochetus communis Ham.
Indigofera linifolia Retz.
Indigofera hirsuta Linn.
INDIGOFERA PULCHELLA Roxb.
MILLETTIA AURICULATA Baker.
Geissaspis cristata W. & A.
Uraria hamosa Wall.
ALYSICARPUS RUGOSUS DC.
Desmodium confertum DC.
Desmodium latifolium DC.
Desmodium gyroides DC.
Abrus precatorius Linn.
Shuteria vestita W. & A.
Dumasia villosa DC.
Mucuna pruriens DC.
Erythrina arborescens Roxb.
SPATHOLOBUS ROXBURGHII Benth.
BUTEA FRONDOSA Roxb.
Pueraria phaseoloides Benth.
DALBERGIA VOLUBILIS Roxb.
DALBERGIA SISSOO Roxb.
Pongamia glabra Vent.
Derris scandens Benth.
MEZONEURUM CUCULLATUM W. & A.
CASSIA TORA Linn.
CASSIA OCCIDENTALIS Linn.
Cassia Sophera Linn.
Cassia mimosoides Linn.
Cassia Fistula Linn.
BAUHINIA MALABARICA Roxb.
Bauhinia purpurea Linn.
Mimosa pudica Linn.
MIMOSA RUBRICAULIS Lam.
Acacia concinna DC.
Acacia pennata Willd.
Albizzia lucida Benth.
Rubus ellipticus Sm.
Fragaria indica Anders.
KALANCHOE SPATHULATA DC.
Bryophyllum calycinum Salisb.
TERMINALIA CHEBULA Retz.

TERMINALIA TOMENTOSA Bedd.
ANOGEISSUS LATIFOLIA Wall.
COMBRETUM DECANDRUM Roxb.
Eugenia Jambolana Lam.
Eugenia sp.
OSBECKIA CHINENSIS Linn.
Osbeckia nepalensis Hook.
MELASTOMA MALABATHRICUM L.
Oxyspora cernua Triana.
WOODFORDIA FLORIBUNDA Salisb.
LAGERSTRŒMIA PARVIFLORA Roxb.
DUABANGA SONNERATIOIDES Ham.
Jussiæa repens Linn.
Bryonia laciniosa Linn.
ZEHNERIA UMBELLATA Thwaites.
Mukia scabrella Arn.
Begonia gigantea Wall.
Opuntia monacantha Haw.
Hydrocotyle rotundifolia Roxb.
Œnanthe stolonifera Wall.
Heteropanax fragrans Seem.
Viburnum punctatum Ham.
Anthocephalus Cadamba Miq.
Adina cordifolia Hook. f.
Stephegyne parvifolia Korth.
HYMENODICTYON EXCELSUM Wall.
Wendlandia exserta DC.
WENDLANDIA ? CORIACEA DC.
Wendlandia pendula DC.
HEDYOTIS SCANDENS Roxb.
Oldenlandia corymbosa Linn.
Mussænda Roxburghii Hook. f.
Randia dumetorum Lamk.
HYPTIANTHERA STRICTA W. & A.
KNOXIA CORYMBOSA Willd.
HAMILTONIA SUAVEOLENS Roxb.
Rubia angustissima Wall.
VERNONIA TERES Wall.
Vernonia subsessilis DC.
VERNONIA CINEREA Less.
Vernonia anthelmintica Willd.
ELEPHANTOPUS SCABER Linn.
ADENOSTEMMA VISCOSUM Forst.
AGERATUM CONYZOIDES Linn.
CONYZA STRICTA Willd.
Blumea obovata DC.
Blumea procera DC.
LAGGERA FLAVA Benth.
LAGGERA ALATA Schultz-Bip.
Anaphalis araneosa DC.
Cæsulia axillaris Roxb.
Inula Cappa DC.
Siegesbeckia orientalis Linn.
Eclipta alba Hassk.
SPILANTHES ACMELLA Linn.
BIDENS PILOSA Linn.
Cosmos sulfureus Cav.
Vicoa auriculata Cass.
Glossogyne pinnatifida DC.
Chrysanthellum indicum DC.
Galinsoga parviflora Cav.
AIRTEMISIA VULGARIS Linn.
Emilia sonchifolia DC.
Lobelia trigona Roxb.
Wahlenbergia gracilis DC.
Plumbago zeylanica Linn.
Embelia robusta Roxb.
ARDISIA HUMILIS Vahl.
SYMPLOCOS SPICATA Roxb.
NYCTANTHES ARBOR-TRISTIS Linn.
Tabernæmontana coronaria R.Br.
Ichnocarpus frutescens R.Br.
Calotropis procera R.Br.
Exacum teres Wall.
EXACUM TETRAGONUM Roxb.
CANSCORA DECUSSATA C. B. Clarke.
Gentiana decemfida Ham.
Swertia angustifolia Ham.
Hydrolea zeylanica Vahl.
Trichodesma indicum Br.

Cynoglossum furcatum Wall.
Cynoglossum lanceolatum Forsk.
Rivea ornata Chois.
ARGYREIA HOOKERI C. B. Clarke.
Lettsomia setosa Roxb.
Ipomœa ?Bona-nox Linn.
Ipomœa hederacea Jacq.
Evolvulus alsinoides Wall.
PORANA PANICULATA Roxb.
Solanum verbascifolium Linn.
SOLANUM INDICUM Linn.
SOLANUM XANTHOCARPUM Schrad. & Wendl.
NICANDRA PHYSALOIDES Gaertn.
Datura Stramonium Linn.
Datura fastuosa Linn.
Mazus rugosus Lour.
LINDENBERGIA GRANDIFLORA Benth.
Lindenbergia urticæfolia Lehm.
Limnophila conferta Benth.
Limnophila sessiliflora Blume.
Herpestis Monnieria H. B. K.
Torenia vagans Roxb.
Scoparia dulcis Linn.
Ægineta indica Roxb.
Utricularia orbiculata Wall.
Oroxylum indicum Vent.
Stereospermum suaveolens DC.
Martynia diandra Glox.
THUNBERGIA COCCINEA Wall.
Hygrophila polysperma T. Anders.
Echinacanthus attenuatus Nees.
ECHINACANTHUS LONGISTYLUS C. B. Clarke.
Dædalacanthus nervosus T. Anders.
Æchmanthera Wallichii Nees.
STROBILANTHES SABINIANUS Nees.
STROBILANTHES CAPITATUS T. Anders.
BARLERIA CRISTATA Linn.
Asystasia macrocarpa Nees.
Lepidagathis hyalina Nees.
ADHATODA VASICA Nees.
RUNGIA PARVIFLORA Nees.
DICLIPTERA BUPLEUROIDES Nees.
Peristrophe bicalyculata Nees.
CALLICARPA MACROPHYLLA Vahl.
GMELINA ARBOREA Linn.
Vitex ?trifolia Linn. f.
CLERODENDRON SERRATUM Spreng.
CLERODENDRON SIPHONANTHUS R. Br.
HOLMSKIOLDIA SANGUINEA Retz.
Ocimum gratissimum Linn.
Geniosporum strobiliferum Wall.
PLECTRANTHUS GERARDIANUS Benth.
PLECTRANTHUS TERNIFOLIUS Don.
Plectranthus striatus Benth.
Pogostemon sp.
Dysophylla cruciata Benth.
COLEBROOKIA OPPOSITIFOLIA Sm.
Mosla dianthera Maxim.
Mentha arvensis Linn.
Scutellaria discolor Coleb.
SCUTELLARIA ANGULOSA Benth.
Scutellaria repens Ham.
Scutellaria rivularis Wall.
Anisomeles ovata R. Br.
LEUCAS MOLLISSIMA Wall.
Leucas hyssopifolia Benth.
Leucas nepetæfolia R. Br.
LEUCAS LINIFOLIA Spreng.
Leonotis nepetæfolia R. Br.
Plantago major Linn.
Bœrhaavia repens Linn.
Deeringia celosioides R. Br.
Amarantus spinosus Linn.
Cyathula capitata Moq.
Cyathula tomentosa Moq.
Achyranthes aspera Linn.
Alternanthera sessilis R. Br.

Chenopodium ambrosioides Linn.
Polygonum tomentosum Willd.
Polygonum glabrum Willd.
Polygonum barbatum Linn.
POLYGONUM HYDROPIPER Linn.
Polygonum flaccidum Meissn.
Polygonum capitatum Ham.
Polygonum chinense Linn.
POLYGONUM MITE Schrank.
Piper nepalense Miq.
Tetranthera glauca Wall.
Loranthus Scurrula Linn.
Loranthus longiflorus Desr.
Viscum monoicum Roxb.
EUPHORBIA PILULIFERA Linn.
Euphorbia neriifolia Linn.
Euphorbia Tirucalli Linn.
BRIDELIA RETUSA Spreng.
Phyllanthus urinaria Linn.
PHYLLANTHUS EMBLICA Linn.
Breynia patens Benth.
ANTIDESMA DIANDRUM Roth.
Jatropha Curcas Linn.
MALLOTUS PHILIPPINENSIS Muell. Arg.
TREMA ORIENTALIS Blume.
STREBLUS ASPER Lour.
Ficus religiosa Linn.
Ficus Cunia Ham.
Ficus glomerata Roxb.
Ficus pyriformis Hook.
Ficus lævis Blume.
Ficus scandens Roxb.
URTICA PARVIFLORA Roxb.
Girardinia heterophylla Decne.
Elatostema rupestre Wedd.
Bœhmeria rugulosa Wedd.
BŒHMERIA PLATYPHYLLA Don.
Maoutia Puya Wedd.
Myrica Nagi Thunb.
Salix tetrasperma Roxb.
Oberonia iridifolia Lindl.
Eria sp.
Arundina bambusifolia Lindl.
Otochilus alba Lindl.
Otochilus sp.
RHYNCHOSTYLIS RETUSA Blume.
Vanda parviflora Lindl.
Saccolabium papillosum Lindl.
Zeuxine sulcata Lindl.
Costus speciosus Sm.
Alpinia ?
DIOSCOREA DÆMONA Roxb.
DIOSCOREA PENTAPHYLLA Linn.
DIOSCOREA ANGUINA Roxb.
Dioscorea glabra Roxb.
DIOSCOREA BULBIFERA Linn.
DIOSCOREA BELOPHYLLA Wight.
Dioscorea sikkimensis Prain & Burkill.
Smilax prolifera Roxb.
ASPARAGUS RACEMOSUS Roxb.
Monochoria hastæfolia Presl.
Commelyna sp.
PHŒNIX HUMILIS Royle.
Phœnix sylvestris Roxb.
Pandanus furcatus Roxb.
Amorphophallus sp.
Colocasia Antiquorum Schott.
Rhaphidophora glauca Schott.
Lasia heterophylla Schott.
Sagittaria sagittifolia Linn.
Kyllingia triceps Roxb.
Kyllingia brevifolia Rottb.
Cyperus flavidus Retz.
CYPERUS TUBEROSUS Rottb.
CYPERUS RADIATUS Vahl.
CYPERUS AURICOMUS Sieber.
Cyperus pumilus Linn.
MARISCUS MICROCEPHALUS Presl.
Fimbristylis dichotoma Vahl.
ERIOPHORUM COMOSUM Wall.
Carex hymenolepis Nees.
PANICUM COLONUM Linn.
Panicum flavidum Retz.
PANICUM PROSTRATUM Lamk.

Panicum indicum Linn.
Panicum myosuroides R. Br.
Thysanolæna acarifera Nees.
OPLISMENUS COMPOSITUS Beauv.
ARUNDINELLA BRASILIENSIS Raddi.
SETARIA GLAUCA Beauv.
Coix Lachryma-Jobi Linn.
POLLINIA ARTICULATA Trin.
SACCHARUM NARENGA Ham.
Saccharum spontaneum Linn.
POGONATHERUM POLYSTACHYUM Kunth.
Andropogon assimilis Steud.
ANDROPOGON FASCICULARIS Roxb.
Andropogon intermedius Willd.
ANDROPOGON ACICULARIS Willd.
Andropogon melanocarpus Elliott.
Andropogon ? distans Nees.
Cymbopogon Martini Stapf.
Anthistiria gigantea Cav.
CHLORIS INCOMPLETA Roth.
Eragrostis amabilis W. & A.
Eragrostis stenophylla Hochst.
CYNODON DACTYLON Pers.
PHRAGMITES KARKA Trin.
BAMBUSA ?
PINUS LONGIFOLIA Roxb.
Ceratopteris thalictroides Linn.
Cheilanthes farinosa Kaulf.
Adiantum Capillus-veneris Linn.
Adiantum caudatum Linn.
Nephrolepis tuberosa Presl.
Polypodium coronans Wall.
Ophioglossum vulgatum Linn.
Lycopodium cernuum Linn.

Sál forests compared with those to the west.

We will now look for east and west elements in this flora.

There is in the Indian Forester, vol. x., 1884, p. 325, a list of the chief constituents of the Sál forest flora in Kheri, and with those forests I propose first to compare the forest seen in the Nepál terai. The following trees or shrubs named in the Kheri list are very conspicuous plants in the Sál forest between Adhabhár and Hettáunda :—*Dillenia pentagyna*, *Kydia calycina*, *Grewia* sp. (in the Nepál forests there is *G. scabrophylla*), *Clausena pentaphylla*, *Leea* sp. (in the Kheri forests it is *L. aspera*), *Semecarpus Anacardium*, *Indigofera* sp. (in the Nepál forests it is *I. pulchella*), *Millettia auriculata*, *Bauhinia* sp. (in the Nepál forests it is *B. malabarica*), *Spatholobus Roxburghii*, *Terminalia Chebula*, *Terminalia tomentosa*, *Lagerstrœmia parviflora*, and *Phyllanthus Emblica* ; while the following named in the Kheri list are present in less obvious degree :—*Ochna pumila*, *Adina cordifolia*, *Stephegyne parvifolia*, *Stereospermum suaveolens*, and *Bridelia retusa*.

The following are found in the Kheri list, and were not seen by me in the Nepál Sál forests :—*Murraya Kœnigii*, *Garuga pinnata*, *Schleichera trijuga*, *Buchanania latifolia*, *Pterocarpus Marsupium*, *Terminalia Bellerica*, *Eugenia* sp., *Careya arborea*, *Casearia graveolens*, *Casearia tomentosa*, *Bassia latifolia*,* *Holarrhena antidysenterica*, *Ficus Rumphii* (F. cordifolia and *Ficus benga-*

lensis. As my journey through the forest was hurried, my failure to record them by no means proves their absence : but it is quite possible that *Schleichera trijuga, Buchanania latifolia, Pterocarpus Marsupium,* and *Bassia latifolia* are really absentees : they are not Sikkim trees.

Other woody plants which I noticed, and which are not named in the Kheri list are :—*Thespesia Lampas, Abroma augusta, Spondias axillaris, Anogeissus latifolia, Symplocos spicata, Nyctanthes Arbor-tristis, Ichnocarpus frutescens* and *Antidesma diandrum.* A few of these, which are almost all shrubs, were common enough to be features of the undergrowth, *e. g.,* the *Thespesia, Anogeissus, Symplocos, Nyctanthes* and *Antidesma* : I think that only *Spondias axillaris* and *Symplocos spicata* can be absent from the Kheri Sál forests.

The Sál forests we know to extent westwards under the hills nearly to the exit of the Sutlej. Many of the associated plants have almost the same western limit.

Eastern plants in the Pine forest.

Associated with the pines on the Chorea Gháti are plants which have no place in the Sál forest, and the dispersal of which is more restricted, among them *Meliosma simplicifolia, Begonia gigantea, Mussænda Roxburghii, Rubia angustifolia, Vernonia subsessilis,* and *Echinacanthus longistylus* are distinctly eastern plants. *Blumea obovata* is known only from this one place.

Markedly eastern nature of the vegetation of the gorge of Bháinsa Duhán.

The vegetation of the damp gorge of Bháinsa Duhán is yet more eastern still in character than the forest of the Chorea Gháti as witness the following plants found there :—*Brachystemma calycinum, Schœpfia fragrans, Natsiatum herpeticum, Shuteria vestita, Dalbergia volubilis, Mezoneurum cucullatum, Acacia concinna, Acacia pennata, Albizzia lucida, Duabanga sonneratioides, Hedyotis scandens, Torenia fragrans, Utricularia orbiculata, Strobilanthes sabinianus, Elatostema rupestre, Otochilus alba, Arundina bambusifolia, Pandanus furcatus,* and *Rhaphidophora glauca.*

In appearance this vegetation distinctly suggests that of the hills below Tindhária in the Darjeeling District.

Cultivation belt ; its common plants.

I pass on to the cultivation area. Forest vegetation in it is limited to steep slopes : elsewhere spread terraced fields. Campbell (Trans.

Agri-Hort. Soc. iv. 1837, p. 59) and Lévi (Le Nepál, i, pp. 297-306) have described these fields with their narrow grassy banks which permit but few plants to grow. The trees most common in the cultivation belt are *Schima Wallichii*, *Alnus nepalensis* and *Acer oblongum*, the bushes *Rubus ellipticus*, *Myrsine capitellata*, *M. semiserrata*, *Eurya acuminata*, *Viburnum coriaceum*, *Rosa moschata*, *Mæsa indica*, *Prinsepia utilis.* and *Melastoma malabathricum ;* the herbs *Pteris aquilina*, *Nephrolepis tuberosa*, *Gleichenia dichotoma*, *Kalanchoe spathulata*, *Drymaria cordata*, *Bœnninghausenia albiflora*, *Parochetus communis*, and various grasses.

The hamlets dotted all over the hill-faces take a large toll of firewood out of whatever forest or scrub is left, and the tendency is to clear the ground more and more. The result is a rarity of well grown trees ; and in Lohári Nepál the timber has wholly disappeared as a result of the old smelting works. Some groves of trees near Khátmándu preserved from the axe, are well grown : the steep slopes, for instance, near Páshupati carry large trees of *Alnus nepalensis*, *Acer oblongum*, *Schima Wallichii*, and *Fraxinus floribunda.* The trees named are all leafy in December : the *Alnus* flowers then. Where the trees are well grown there is little under them but here and there a bush of *Daphne cannabina* with fragrant white flowers.

Where the trees have been cut from off the steep slopes, shrubs generally remain with an abundant herbaceous vegetation between them. If, for instance, one goes to the edge of the valley of Nepál and begins to climb the lower slopes of the hills that bound it, one finds oneself among *Pyrus Pashia*, *Symplocos theæfolia*, *Myrsine capitellata*, *Luculia gratissima* and *Mæsa indica* ; none of these growing higher than fifteen feet and generally only six feet high. In many places among them is *Camellia Thea*—the Tea bush, healthy and vigorous.

Phyllanthus parvifolius is not uncommon.

The herbs among the bushes are such as :—*Drymaria cordata*, *Bœnninghausenia albiflora*, *Artemisia vulgaris*, *Anaphalis cinnamomea*, *Anaphalis contorta*, *Swertia angustifolia*, *Lindenbergia grandiflora*, *Æchmanthera Wallichii*, *Anisomeles ovata*, *Pteris aquilina*, and *Gleichenia linearis.*

The Downs in the cultivation belt.

The downs above Márkhu and near Pherphing carry short grass at the beginning of December, with the little blue bells of *Campanula sylvatica* dotting them. The grasses of the downs are chiefly *Pollinia* and *Anthistiria imberbis*: flowerless in December on them stand plants of *Potentilla fulgens*, *Teucrium quadrifarium*, *Artemisia parviflora*, *Hypericum japonicum*, *Hypericum elodeoides*, *Swertia paniculata*, *Swertia parviflora* and an Umbellifer. *Micromeria biflora* occurs near Chitlong and abundantly about Jáitpur.

Lotus corniculatus occurs at Chitlong—its eastern limit as far as at present known. With it on grassy banks are two *Violas*, *Gentiana*, a *Stellaria* and an *Arenaria*: and not far away *Oldenlandia gracilis* was found. The *Oldenlandia* finds its eastern known limit there; and Nepál is also the eastern known limit of *Campanula sylvatica*.

To see *Micromeria biflora* growing with an abundance of *Rosa moschata*, *Rubus ellipticus*, and *Prinsepia utilis* suggests the vegetation of the Simla hills. But after enumerating the plants found in the cultivation belt in discussing the east and west affinities, we shall see that the flora is distinctly eastern.

The cold winds and hail storms of Lohári Nepál are proverbial. With this cold and the denudation of its forests the valley has become peculiar.

Crops in the cultivation belt.

In the cultivation belt besides crops of Marwa (*Eleusine coracana* Gaertn.), wheat, Juár, and Buckwheat (*Fagopyrum esculentum* Moench), were seen Tobacco, imported chillies (*Capsicum annuum* Linn.), Turnips and sárson, Radishes, Fenugreek, Chinese cabbage and *Dioscorea alata* Linn.

Oranges grow well, and apples satisfactorily; but the former do better below the cultivation belt than in it.

A list of all the plants observed in the cultivation belt.

The following is a list of the plants observed in the cultivation belt: as before capitals indicate the more common plants.

CLEMATIS BUCHANANIANA DC.
Anemone sp.
Ranunculus sceleratus Linn.
Berberis asiatica Roxb.
Berberis nepalensis Spr.
Fumaria sp.
Cardamine hirsuta Linn.
Viola canescens Wall.
Viola sp.
Polygala arillata Ham.
Stellaria ? saxatilis Wall.
Cerastium triviale Link.
Cerastium glomeratum Thuill.
Arenaria ? serpyllifolia Linn.
DRYMARIA CORDATA Willd.
HYPERICUM ELODEOIDES Choisy.
HYPERICUM JAPONICUM Thumb.
Cleyera ochnacea DC.
Eurya symplocina Blume.
Eurya acuminata DC.

SCHIMA WALLICHII Choisy.
Camellia theifera Griffith.
REINWARDTIA TRIGYNA Planch.
GERANIUM NEPALENSE Sweet.
OXALIS CORNICULATA Linn.
Impatiens densifolia Hook. f.
Impatiens Pershadiana Hook. f.
BŒNNINGHAUSENIA ALBIFLORA Reichb.
Evodia fraxinifolia Hook. f.
Zanthoxylum ovalifolium Wight.
ZANTHOXYLUM ALATUM Roxb.
Melia Azadirachta Linn.
Heynea trijuga Roxb.
ILEX EXCELSA Wall.
Celastrus paniculata Willd.
Zizyphus incurva Roxb.
Zizyphus Œnoplia Mill.
Acer oblongum Wall.
Dobinea vulgaris Ham.
Rhus succedanea Linn.
RHUS WALLICHII Hook. f.
Crotalaria prostrata Roxb.
Crotalaria sessiliflora Linn.
PAROCHETUS COMMUNIS Ham.
Lotus corniculatus Linn.
Desmodium confertum DC.
Desmodium parvifolium DC.
Abrus pulchellus Wall.
Shuteria vestita DC.
Mezoneurum cucullatum W. & A.
Cassia occidentalis Linn.
CASSIA LÆVIGATA Willd.
Prunus Puddum Roxb.
PRINSEPIA UTILIS Royle.
Rubus moluccanus Linn.
RUBUS ELLIPTICUS Sm.
Fragaria indica Anders.
POTENTILLA FULGENS Wall.
ROSA MOSCHATA Mill.
Stranvæsia glaucescens Lindl
ASTILBE RIVULARIS Ham.
DICHROA FEBRIFUGA Lour.
KALANCHOE SPATHULATA DC.
Bryophyllum calycinum Salisb.
Eugenia sp.
OSBECKIA NEPALENSIS Hook.
MELASTOMA MALABATHRICUM Linn.
Oxyspora cernua Triana.
Lagerstrœmia parviflora Roxb.
WOODFORDIA FLORIBUNDA Salisb.
Bryonia laciniosa Linn.
HYDROCOTYLE ROTUNDIFOLIA Roxb.
Sanicula europæa Linn.
HEDERA HELIX Linn.
CORNUS CAPITATA Wall.
VIBURNUM STELLULATUM Wall.
LUCULIA GRATISSIMA Sweet.
WENDLANDIA ? CORIACEA DC.
Hedyotis scandens Roxb.
Oldenlandia gracilis DC.
Ophiorrhiza fasciculata Don.
HAMILTONIA SUAVEOLENS Roxb.
RUBIA CORDIFOLIA Linn.
Dipsacus inermis Wall.
Vernonia teres Wall.
Vernonia cinerea Less.
Vernonia anthelmintica Wild.
Adenostemma viscosum Forst.
AGERATUM CONYZOIDES Linn.
ERIGERON BELLIDIOIDES Benth.
Conyza japonica Less.
Laggera alata Schultz-Bip.
Laggera pterodonta Benth.
Anaphalis triplinervis C. B. Clarke.
Anaphalis araneosa DC.
ANAPHALIS CONTORTA Hook. f.
Gnaphalium luteo-album Linn.
Siegesbeckia orientalis Linn.
Spilanthes Acmella Linn.
GALINSOGA PARVIFLORA Cav

ARTEMISIA PARVIFLORA Roxb.
ARTEMISIA VULGARIS Linn.
Senecio chrysanthemoides DC.
SENECIO VAGANS Wall.
Cnicus argyracanthus DC.
Picris hieracioides Linn.
Sonchus arvensis Linn.
Launæa nudicaulis Less.
Tagetes patula Linn.
Lobelia radicans Thunb.
Campanula sylvatica Wall.
Gaultheria fragrantissima Wall.
Pieris ovalifolia Don.
Rhododendron arboreum Sm.
PLUMBAGO ZEYLANICA Linn.
Androsace saxifragæfolia Bunge.
MÆSA RAMENTACEA A. DC.
Mæsa macrophylla Wall.
Myrsine africana Linn.
Myrsine semiserrata Wall.
Myrsine capitellata Wall.
Embelia Ribes Burm.
Ardisia humilis Vahl.
Symplocos theæfolia Ham.
Jasminum humiles Linn.
Nyctanthes Arbor-tristis Linn.
FRAXINUS FLORIBUNDA Wall.
LIGUSTRUM NEPALENSE Wall.
Buddleia asiatica Lour.
Gentiana capitata Ham.
Gentiana pedicellata Wall.
SWERTIA AUGUSTIFOLIA Ham.
SWERTIA PANICULATA Wall.
SWERTIA DILATATA C. B. Clarke.
Cynoglossum furcatum Wall.
Bothriospermum tenellum Fisch. et Mey.
Cuscuta reflexa Roxb.
Solanum xanthocarpum Schrad. et Wend.
Solanum indicum Linn.
Nicandra physaloides Gaertn.
DATURA STRAMONIUM Linn.
Datura fastuosa Linn.
Verbascum Thapsus Linn.
LINDENBERGIA GRANDIFLORA Benth.
Lindenbergia philippensis Benth.
Lindenbergia urticæfolia Lehm.
Vandellia crustacea Benth.
Veronica Anagallis Linn.
Utricularia bifida Linn.
Oroxylum indicum Vent.
Thunbergia fragrans Roxb.
Thunbergia coccinea Wall.
Hemigraphis latebrosa Nees.
ÆCHMANTHERA WALLICHII Nees.
Strobilanthes penstemonoides T. Anders.
Lepidagathis hyalina Nees.
ADHATODA VASICA Nees.
Rungia parviflora Nees.
Dicliptera bupleuroides Nees.
Clerodendron infortunatum Gaertn.
HOLMSKIOLDIA SANGUINEA Retz
Plectranthus Gerardianus Benth.
Coleus barbatus Benth.
POGOSTEMON GLABER Benth.
Colebrookia oppositifolia Smith.
ELSHOLTZIA BLANDA Benth.
Mentha arvensis Linn.
MICROMERIA BIFLORA Benth.
Calamintha longicaulis Benth.
Scutellaria discolor Colebr.
Scutellaria repens Ham.
Prunella vulgaris R. Br.
Craniotome versicolor Reichb.
Anisomeles ovata R. Br.
Colquhounia coccinea Wall.
Leucas Cephalotes Spreng.
Teucrium quadrifarium Ham.

Plantago major Linn.
Deeringia celosioides R. Br.
Amarantus spinosus Linn.
CYATHULA TOMENTOSA Moq.
Cyathula capitata Moq.
Alternanthera sessilis R. Br.
Chenopodium ambrosioides Linn.
Polygonum Hydropiper Linn.
POLYGONUM CAPITATUM Ham.
Polygonum chinense Linn.
Litsæa oblonga Wall.
Litsæa lanuginosa Nees.
Daphnidium bifarium Nees.
DAPHNE CANNABINA Wall.
Elæagnus latifolia Linn.
Euphorbia neriifolia Linn.
Euphorbia pilosa Linn.
SARCOCOCCA PRUNIFORMIS Lindl.
Andrachne cordifolia Muell.-Arg.
PHYLLANTHUS PARVIFOLIUS Ham.
Jatropha Curcas Linn.
Celtis australis Linn.
Ficus religiosa Linn.
URTICA PARVIFLORA Roxb.
Pilea anisophylla Wedd.
Lecanthus Wightii Wedd.
ELATOSTEMA LINEOLATUM Wight.
Girardinia heterophylla Dcne.
ALNUS NEPALENSIS Don.
QUERCUS SEMECARPIFOLIA Smith.
Quercus lanuginosa Don.
Quercus glauca Thunb.
CASTANOPSIS INDICA A. DC.
Salix tetrasperma Roxb.
Carpinus viminea Wall.
Ceratophyllum demersum Linn.
Hydrilla verticillata Casp.
Otochilus alba Lindl.
AGAVE VERA-CRUZ Mill.
Agave Wightii Drummond & Prain.
Dioscorea belophylla Voigt.
Dioscorea sikkimensis Prain & Burkill.
Smilax parvifolia Wall.
Pandanus furcatus Roxb.
Remusatia vivipara Schott.
Colocasia Antiquorum Schott.
Lemna sp.
Potamogeton oblongus Viv.
Potamogeton crispus Linn.
Eriocaulon sp.
ERIOPHORUM COMOSUM Wall.
CAREX FILICINA Nees.
Thysanolæna acarifera Nees.
POLLINIA ARGENTEA Trin.
Ischæmum angustifolium Hack.
Erianthus fulvus Nees.
Andropogon assimilis Steud.
Andropogon contortus Linn.
ANTHISTIRIA IMBERBIS Retz.
Eleusine coracana Gaertn.
Eragrostis stenophylla Hochst.
GLEICHENIA DICHOTOMA Wall.
Alsophila sp.
NEPHROLEPIS TUBEROSA Presl.
Polypodium coronans Wall.
POLYPODIUM SIMPLEX Sw.
PTERIS AQUILINA Linn.
Equisetum ? *debile* Roxb.

The plants which reach from the cultivation belt down to the plains of Bengal or avoiding them re-appear in Chota Nagpur.

Out of the above 247 plants, thirty-seven are of general distribution in Bengal—forty-seven, while not of general distribution, occur in Chota Nágpur, twenty-five occur in Chittagong, twenty-four appear in Northern Bengal chiefly in the Duárs, twenty-two are recorded from Behár, ten from the plains of Tirhut, nine from central Bengal and nine from Eastern Bengal. That Behár should possess so many is due to its higher lands bordering on Chota Nágpur, if we add Behár to Tirhut the number common to the Nepál Cultivation belt and Behár-Tirhut is twenty-five, being *Hypericum japonicum*, *Reinwardtia trigyna*, *Heynea trijuga*, *Celastrus paniculata*, *Crotalaria prostrata*, *Melastoma malabathricum*, *Lagerstrœmia parviflora*, *Woodfordia floribunda*, *Oldenlandia gracilis*, *Hamiltonia suaveolens*, *Vernonia teres*, *Launæa nudicaulis*, *Androsace saxifragæfolia*, *Nyctanthes Arbortristis*, *Bothriospermum tenellum*, *Hemiphragma latebrosa*, *Lepidagathis hyalina*, *Clerodendron infortunatum*, *Deeringia celosioides*, *Salix tetrasperma*, *Thysanolæna acarifera*, *Pollinia argentea*, *Ischæmum angustifolium*, *Andropogon assimilis*, and *Andropogon contortus*.

If we add together the thirty-seven plants which are of general distribution in Bengal and the plants which are common to the cultivation belt and the other places mentioned, then

84 or 34 per cent. are common to this belt in Nepál and Chota Nágpur.

62 or 25 per cent. are common to this belt in Nepál and Chittagong.

61 or 25 per cent. are common to this belt in Nepál and northern Bengal including the Duárs.

59 or 24 per cent. are common to this belt in Nepál and the plains of Behár-Tirhut.

It is certainly of interest to notice that the percentage of plants common to the belt and Chota Nágpur is greater by 10 per cent. than the percentage of plants common to the belt and the plains below : this difference is of course due to the elevation of the Chota Nágpur plateau. It is also of interest further to note that the Duárs and Chittagong have no greater percentage in common with this belt than have the plains below.

In the cultivation belt may be found a very considerable number of plants,—nearly fifty in the above list,—which extend southwards very generally throughout India.

Montane plants of the Himalaya which extend eastwards or westwards from Nepal.

There are in the list just over one hundred and twenty montane plants the distribution of which goes both eastwards and westwards beyond Nepál.

Two of these plants, *Wendlandia pendula* and *Senecio vagans*, have been collected both in the central Himalaya and in the extreme east of the kingdom of Nepál.

The following montane plants extend from Nepál eastwards only beyond the boundary of the kingdom:—*Polygala arillata, Stellaria saxatilis, Cleyera ochnacea, Eurya symplocina, Schima Wallichii, Heynea trijuga, Zizyphus incurva, Dobinea vulgaris, Desmodium confertum, Shuteria vestita, Mezoneurum cucullatum, Rubus moluccanus, Stranvæsia glaucescens, Dichroa febrifuga, Osbeckia nepalensis, Oxyspora cernua, Bryonia laciniosa, Luculia gratissima, Wendlandia coriacea, Hedyotis scandens, Gaultheria fragrantissima, Mæsa ramentacea, Mæsa macrophylla, Myrsine semiserrata, Myrsine capitellata, Symplocos theæfolia, Swertia dilatata, Strobilanthes penstemonoides, Pogostemon glaber, Elsholtzia blanda, Litsæa oblonga, Pilea anisophylla, Castanopsis indica, Otochilus alba, Pandanus furcatus, Carex filicina,* and *Polypodium coronans.*

The following extend from Nepal westwards only :—*Arenaria serpyllifolia, Rhus Wallichii, Lotus corniculatus, Erigeron bellidioides, Myrsine africana, Ligustrum nepalense, Swertia paniculata, Coleus barbatus, Euphorbia pilosa, Celtis australis,* and *Anthistiria imberbis,* var. *Roylei.*

Rosa moschata might almost be classed as western, for it disappears in Sikkim ; but it re-appears in the Chumbi valley and Bhutan.

We must admit a greatly preponderating eastern element.

Of interesting irregular distribution are :—

Lobelia radicans : Khasi hills, Ránçhi and Nepál ; it is probably an introduced plant in Nepál.

Nyctanthes Arbor-tristis : the hills of southern India generally and in the north along the lower Himalaya from Nepál westwards ; not in Sikkim ; to the east in the hills of Assam and Burma.

Lindenbergia philippensis : Burma and Assam, jumping from Chittagong and the Naga hills to Nepál, being in this respect rather like *Lobelia radicans.*

Temperate Forest Belt : its characteristic plants.

The temperate forests I am inclined to define by the presence of Rhododendrons. *Rhododendron arboreum* occurs first above Sisaghári, with pines and *Quercus semecarpifolia,* making on this south side of the pass a thin forest.

The grass in December under these trees above Sisaghári is yellow and contains an abundance of *Anaphalis contorta* out of flower. On the north side of the pass there is less grass, and there are more bushes, *e.g.*, of *Luculia gratissima, Viburnum stellulatum, Rhus succedanea* with red autumn leaves, and two species of *Rubus,* together with trees of *Prunus Puddum* and Lauraceæ. Mosses just at the

Chessapani pass festoon the trees; and epiphytes are abundant, chiefly the orchid *Otochilus alba*, and *Peperomia reflexa*. Under the trees just at the pass occur the following, whose generic names in a large measure suggest a temperate flora:—*Clematis grewiæflora*, *Hypericum patulum*, *Bœnninghausenia albiflora*, *Galium Aparine*, *Galium Mollugo*, *Valeriana Hardwickii*, *Dipsacus inermis*, *Gerbera macrophylla*, *Myriactis nepalensis*, *Swertia nervosa*, *Cuscuta reflexa*, *Cynoglossum furcatum*, *Strobilanthes glutinosus*, *Craniotome versicolor*, and *Calamintha umbrosa*.

The forest above Chitlong on Chándagiri begins with *Quercus semecarpifolia*, *Rhododendron arboreum*, *Pyrus Pashia* and *Prunus Puddum*. It continues over the crest, pines being absent, and down the steep slope to Thánkot, *Quercus glauca* in the upper parts being very common.

Under the trees we get bushes of *Jasminum humile*, *Hypericum patulum*, *Berberis aristata*, *B. nepalensis*, *Buddleia macrostachya*, *Viburnum stellulatum*, *Randia tetrasperma*, *Neillia thyrsiflora*, *Embelia Ribes*, and *Eurya acuminata*. We find climbers such as *Vitis semicordata*, *Smilax prolifera*, *Trachelospermum fragrans* and *Euonymus vagans*; and sprawling bushes of *Rubus acuminatus*, *Senecio scandens*, and *Asparagus racemosus*; herbs as *Ranunculus pennsylvanicus*, *Thalictrum sp.*, *Sanicula europæa*, *Pimpinella diversifolia*, *Heracleum* sp., *Galium sp.*, *Dipsacus inermis*, *Valeriana Hardwickii*, *Senecio vagans*, *Artemisia vulgaris*, *Cnicus Wallichii*, *Lactuca hastata*, *Lindenbergia grandiflora*, *Dicliptera Roxburghii*, *Girardinia heterophylla*, and *Polygonatum*. *Viscum articulatum* was on the oak trees.

A remark must be made in passing regarding *Senecio scandens*: my specimens exactly agree with Wallich's *S. flexuosus* founded on material collected in Nepál; and it may perhaps be a definable variety.

The forest south of Cháṇdagiri along the Pherphing-Támbeh-kháni road has been very much cut over: full grown trees are rare in it; but on the less accessible slopes well above the road is better forest.

In the well cut-over forest *Rhododendron arboreum* is plentiful on shady slopes mixed with polled trees of *Quercus lanuginosa*, *Pieris ovalifolia*, *Viburnum coriaceum* and *Rhus Wallichii*.

On sunny slopes grass occurs plentifully with *Anaphalis contorta* and *Phyllanthus parvifolius*. *Aechmanthera Wallichii* is in places very abundant. *Alnus nepalensis*, as a small tree, appears. *Carpinus*

Mr. C. G. Rogers has called my attention to the low level at which *Quercus semecarpifolia* here appears. Looking up my records I find that I found it once three marches from Simla at 8,000 feet. Sir Henry Collett (Flora Simlensis, 1902, p. 474) gives its lower limit as 8,500 feet: and Mr. Rogers finds the limit to be much higher in Jaunsar.

grows sparingly; and *Berberis nepalensis*. Orchids, *Peperomia*, *Polypodium coronans* and *Usnea* are present as epiphytes. *Jasminum humile*, in December flowerless and frost bitten, was seen plentifully in one spot. *Viburnum coriaceum*, *Cleyera ochnacea*, *Cornus oblonga*, *Galium rotundifolium*, *Coleus barbatus* and *Astilbe rivularis*, were observed.

The forest round Kakni is altogether cut over: here and there in it stout tree stumps suggest what has been; but there are no large trees now. The small trees there are chiefly *Prinsepia utilis*, *Mæsa ramentacea*, *Gaultheria fragrantissima*, *Luculia gratissima*, *Daphne cannabina*, *Cratægus crenulata*, *Viburnum coriaceum*, *Randia tetrasperma*, and *Ilex excelsa*. Patches of *Gleichenia longissima* occur in hollows. *Pteris aquilina* is sporadic.

Two species of *Anaphalis* had flowered very abundantly over the grassy parts of the hill top, where grew also *Potentilla fulgens*. In the most shady places mosses and *Selaginella* were very abundant. Two species of *Galium* occurred. *Pardanthus chinensis* and an *Arisaema*, perhaps *A. concinnum*, occurred. *Swertia dilatata* was very common. with *Pratia begonifolia*, *Sanicula europæa*, *Trifolium repens*, *Galinsoga parviflora* and *Myriactis nepalensis*.

The nectaries of *Swertia dilatata* appear better developed in Nepál than in Sikkim.

The vegetation on the Sángli Khola was found to be very like that at Kakni. But of plants not seen at Kakni were found on the Sángli khola: —*Gynura angulosa*, *Dichrocephala latifolia*, *Anaphalis araneosa*, *Anaphalis adnata*, and *Mæsa macrophylla*.

Lichens are not uncommon on the tree stems especially of *Pyrus*.

A list of all the plants observed in the temperate Forest Belt.

The following is a list of all the plants observed in the temperate forest: capitals in it indicate abundance.

CLEMATIS BUCHANANIANA DC.
CLEMATIS GREWIÆFLORA DC.
Thalictrum sp.
Ranunculus diffusus DC.
Ranunculus pennsylvanicus Linn.
Berberis aristata DC.
BERBERIS NEPALENSIS Spreng.
HYPERICUM PATULUM Thunb.
HYPERICUM JAPONICUM Thunb.
EURYA ACUMINATA DC.
Schima Wallichii Choisy.
Camellia theifera Griffith.
Reinwardtia tetragyna Planch.
Geranium nepalense Sw.
Impatiens aureola Hook. f.
BŒNNINGHAUSENIA ALBIFLORA Reichb.
Cipadessa fruticosa Blume.
Ilex excelsa Wall.
Euonymus vagans Wall.
Vitis semicordata Wall.
Rhus Wallichii Hook. f.
Priotropis cytisoides W. & A.
Trifolium repens Linn.

Indigofera sp.
PRUNUS PUDDUM Roxb.
Prinsepia utilis Royle.
Neillia thyrsiflora D. Don.
Rubus acuminatus Sm.
RUBUS PANICULATUS Sm.
Rubus ellipticus Sm.
POTENTILLA FULGENS Wall.
Rosa moschata Mill.
PYRUS PASHIA Ham.
CRATÆGUS CRENULATA Roxb.
Cotoneaster bacillaris Wall.
TIARELLA POLYPHYLLA Don.
Hydrangea ?aspera Don.
DICHROA FEBRIFUGA Lour.
Oxyspora paniculata DC.
AMMANNIA ROTUNDIFOLIA Ham.
Begonia laciniata Roxb.
HYDROCOTYLE ?ROTUNDIFOLIA Roxb.
Hydrocotyle javanica Thunb.
SANICULA EUROPÆA Linn.
Pimpinella diversifolia DC.
HERACLEUM sp.
HEDERA HELIX Linn.
Cornus oblonga Wall.
VIBURNUM STELLULATUM Wall.
VIBURNUM CORIACEUM Blume.
Luculia Pinceana Hook. f.
RANDIA TETRASPERMA Roxb.
LEPTODERMIS LANCEOLATA Wall.
Rubia cordifolia Linn.
Galium rotundifolium Linn.
Galium Aparine Linn.
Galium Mollugo Linn.
VALERIANA HARDWICKII Wall.
DIPSACUS INERMIS Wall.
Dichrocephala latifolia DC.
MYRIACTIS NEPALENSIS Less.
ANAPHALIS CINNAMOMEA C. B. Clarke.
Anaphalis adnata DC.
Anaphalis araneosa DC.
ANAPHALIS CONTORTA Hook. f.
Galinsoga parviflora Cav.
Artemisia vulgaris Linn.
Gynura angulosa DC.
SENECIO SCANDENS Wall.
Senecio densiflorus Wall
SENECIO VAGANS Wall.
Cnicus Wallichii DC.
Ainsliæa pteropoda DC.
Ainsliæa aptera DC.
GERBERA MACROPHYLLA Benth.
LACTUCA HASTATA DC.
PRATIA BEGONIFOLIA Lindl.
Lobelia pyramidalis Wall.
Campanumæa inflata C. B. Clarke.
CAMPANULA COLORATA Wall.
GAULTHERIA FRAGRANTISSIMA Wall.
PIERIS OVALIFOLIA Don.
RHODODENDRON ARBOREUM Sm.
Mæsa ramentacea A. DC.
Mæsa macrophylla Wall.
MYRSINE SEMISERRATA Wall.
MYRSINE CAPITELLATA Wall
Embelia Ribes Burm.
SYMPLOCOS THEÆFOLIA Ham.
Jasminum humile Linn.
Trachelospermum fragrans Hook. f.
Buddleia ? macrostachya Benth.
Swertia paniculata Wall.
SWERTIA DILATATA C. B. Clarke.
Swertia nervosa Wall.
Swertia angustifolia Ham.
Cynoglossum furcatum Wall.
Cuscuta reflexa Roxb.
Lindenbergia grandiflora Benth.
Hemiphragma heterophylla Wall.
Æchmanthera Wallichii Nees.

Strobilanthes glutinosus Nees.
Strobilanthes pentstemonoides T. Anders.
Dicliptera roxburghiana Nees.
Elsholtzia ?strobilifera Benth.
Calamintha umbrosa Benth.
Calamintha longicaulis Benth.
Scutellaria repens Ham.
Craniotome versicolor Reichb.
Leucas ciliata Benth.
Plantago major Linn.
Deeringia celosioides R. Br.
Peperomia reflexa Dietr.
DAPHNE CANNABINA Wall.
Loranthus odoratus Wall.
Loranthus Scurrula Linn.
Loranthus umbellifer Schultz.
Viscum articulatum Burm.
OSYRIS ARBOREA Wall.
PHYLLANTHUS PARVIFOLIUS Ham.
Urtica parviflora Roxb.
Girardinia heterophylla Decne.
Lecanthus Wightii Wedd.
ELATOSTEMA LINEOLATUM Wight.
ALNUS NEPALENSIS Don.
QUERCUS SEMECARPIFOLIA Smith.
Quercus lanuginosa Don.
QUERCUS GLAUCA Thunb.
Carpinus viminea Wall.
OTOCHILUS ALBA Lindl.
Pardanthus chinensis Ker.
Agave Vera-Cruz Mill.
Agave Wightii Drummond & Prain.
SMILAX PARVIFOLIA Wall.
Asparagus racemosus Roxb.
TUPISTRA AURANTIACA Wall.
Colocasia Antiquorum Schott.
Arisæma sp.
ANDROPOGON ASSIMILIS Steud.
ARUNDINARIA sp.
Gleichenia dichotoma Wall.
GLEICHENIA LONGISSIMA Blume.
Polypodium sp.
PTERIS AQUILINA Linn.

Very few plants of the Temperate Forest Belt reach the plains but a few reappear on Parasnath and in the Chittagong hills.

In the temperate forest belt the vegetation is very different from that of the plains: and of the plants in the above list only *Ammannia rotundifolia*, *Dicliptera Roxburghiana*, *Asparagus racemosus* and *Colocasia Antiquorum* are at all general in the plains of Bengal.

The few indigenous plants common to this belt and the Chotá Nágpur plateau, with Párasnáth rising to 4,000 ft., may be named: they are *Hypericum japonicum*, *Rubia cordifolia*, *Calamintha umbrosa*, *Peperomia reflexa*, *Loranthus Scurrula*, *Viscum articulatum*, *Girardinia heterophylla* and *Andropogon assimilis*.

The hills of Chittagong carry almost the same number, *viz.*, *Hypericum japonicum*, *Eurya acuminata*, *Schima Wallichii*, *Mæsa ramentacea*, *Æchmanthera Wallichii*, *Loranthus Scurrula* and *Gleichenia linearis*. Every one of these is found in the Sikkim Himalaya and mountains of Assam. *Mæsa ramentacea* and *Loranthus Scurrula* reach their western known limit in Nepál.

Distribution of the montane plants along the Himalaya: some avoid wet Sikkim.

The montane plants are for the most part of general distribution along the Himalaya, a very large portion of them growing all along the chains from Káshmir eastwards to Sikkim and Bhután. A slightly less part while not growing in Káshmir grow in Garhwál and Kumáon and thence extend eastwards through Nepál to Sikkim and Bhután. *Six interesting plants of this wide distribution avoid the wet hills of Sikkim but re-appear in the mountains east of Sikkim: they are *Hypericum patulum*, *Ilex excelsa*, *Rosa moschata*, *Cornus oblonga*, *Jasminum humile*, *Trachelospermum fragrans* and *Osyris arborea* *Randia tetrasperma*, and *Prinsepia utilis*, while not completely avoiding Sikkim, are there confined to the drier remote regions in the interior of the mountains. *Leptodermis lanceolata* is very similarly distributed.

Eastern and Western Elements.

The following plants are eastern :—*Schima Wallichii*, *Euonymus vagans*, *Priotropis cytisoides*, *Neillia thyrsiflora*, *Dichroa febrifuga*, *Tiarella polyphylla*, *Oxyspora paniculata*, *Begonia laciniata*, *Luculia gratissima*, *Senecio densiflorus*, *Senecio vagans*, *Pratia begonifolia*, *Gaultheria fragrantissima*, *Mæsa ramentacea*, *Mæsa macrophylla*, *Myrsine semiserrata*, *Myrsine capitellata*, *Symplocos theæfolia*, *Buddleia macrostachya*, *Swertia dilatata*, *Swertia nervosa*, *Strobilanthes pentstemonoides*, *Leucas ciliata*, *Loranthus odoratus*, *Loranthus Scurrula*, *Loranthus umbellifer*, *Otochilus alba*, and *Tupistra aurantiaca*: and the following are western :—*Rhus Wallichii*, *Swertia paniculata*, *Strobilanthes glutinosus*, and doubtfully *Cotoneaster bacillaris*.

On the whole then the flora of these ridge tops, where clouds are apt to gather, and the trees, as in Sikkim, to be festooned with mosses, is more eastern than western.

One plant of the belt has a peculiar distribution. It is *Ranunculus pennsylvanicus*, which while climbing to 6,000 ft. in the Khási hills, mountains of Burma and Nepál has been found on the Panjáb plain at Ludhiána and on the Ganges at Bhojpur Both Wallich and Scully collected it in Nepál.

CONCLUSIONS.

What is written above is, indeed, but a superficial account of the features of the vegetation between Raksal and the Himalaya of Central Nepál as far back as 35 miles in a straight line from the skirts of the plains and not higher than 7,000 feet. There was but one excuse for writing it, *i.e.*, the great want of knowledge of the Botany of that part of the chain.

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* Although not mentioned in the Flora of British India, as found in Sikkim *Hypericum patulum*, *Jasminum humile* and *Trachelospermum fragrans* do occur there. [Editor].

The outstanding result is an expression of the easternness of the vegetation. It is so much more like that of the Darjeeling District than that of the North-Western Himalaya. In bringing forward this statement I do but emphasize what Sir Joseph Hooker has already stated in the Imperial Gazetteer of India (Oxford, 1907) i, 165, where he classes Central Nepál with Sikkim.

The botanist who has not visited both places has largely to rely on statistics for comparative purposes. I have treated above, as far as I can, my subject from his point of view and have shown that:—

1. The sál (*Shorea robusta*) forests of the tropical forest belt seem not to possess trees of *Schleichera trijuga, Buchanania latifolia, Pterocarpus Marsupium* and *Bassia latifolia*, which are wanting likewise in the Sikkim Terai forests, but present in the Kheri forests; while they possess *Spondias axillaris* and *Symplocos spicata*, of which the reverse is the case. They are thus a little more eastern than western.
2. The pine forests of the Chorea Gháti hills have six plants in them obviously eastern, *viz.*, *Meliosma simplicifolia, Begonia gigantea, Mussænda Roxburghii, Vernonia subsessilis* and *Echinacanthus longistylus*, and considering their Flora as a whole are rather eastern.
3. The tangle of vegetation in the Bháinsa Duhán gorge contains the following distinctly eastern plants—*Brachystemma calycinum, Schœpfia fragrans, Natsiatum herpeticum, Shuteria vestita, Dalbergia volubilis, Mezoneurum cucullatum, Acacia concinna, Acacia pennata, Albizzia lucida, Duabanga sonneratioides, Hedyotis scandens, Torenia fragrans, Utricularia orbiculata, Strobilanthes sabinianus, Elatostema rupestre, Otochilus alba, Arundina bambusifolia, Pandanus furcatus* and *Rhaphidophora glauca*. It is distinctly eastern.
4. The cultivation belt carries 37 plants which have not been collected west of Nepál, and only 11 which have not been collected east.
5. The temperate forest belt carries 28 plants which have not been collected west of Nepál, and only 3 or 4 which have not been collected east.

Now having myself been in both places, I wish next to exchange the statistical method for the ecological, and to compare the eye-appearances of the vegetation in Sikkim and Nepál. The comparison will be much more superficial than is desirable, but will be a beginning of knowledge of the relationship of the two.

First of all to the eye the Sál forests under the hills present great similarities. On the edge in both places, the tall scarlet *Leonotis nepetæfolia* and the lilac *Plectranthus ternifolius* occur. *Stereospermum suaveolens*, *Heynea trijuga* and *Cedrela Toona* flourish where the forest is not pure; and *Anisomeles ovata* is common. Dioscoreas and other climbers, with annual stems, twine round the sál trees separately, not binding them together; and a variety of smallish plants find a place in the shade.

The dissimilarities which are noteworthy are that epiphytic orchids and the epiphyte *Polypodium coronans* are far more common in the Sikkim Terai forests than in those of the Nepál Terai; and that while *Nyctanthes* makes a feature in parts of the Nepál forests it is absent from those of Sikkim.

Just where the level Sál forest gives place to the pines on the slopes of the Chorea Gháti hills, *Desmodium confertum* becomes most abundant: it is a plant very common in the Sál forests of the Darjeeling district at a little distance from the plains. *Boehmeria platyphylla* is like it common in the two places, and both *Deeringia celosioides* and *Polygonum chinense* are common in the Sál forests of the Nepál hills and in the Tista valley of Sikkim.

The pine forests of the Chorea Gháti are absent from the Sikkim Himalaya. The pines (*Pinus longifolia*) are quite absent from the hill faces south of Darjeeling, and almost absent from the Tista valley where they do but grow on some dry rocky spurs near Pashok, which is over the junction of the Tista and Runjit; and they grow in the Runjit valley, as at Badamtam. Of the plants associated with them in Nepál, *Æchmanthera Wallichii* and *Scutellaria repens* absent themselves in Sikkim. *Blumea obovata* is also absent; *Swertia angustifolia*, var. *Wallichii* and *Anaphalis araneosa* are rare or absent from the wetter hill faces of Sikkim, though found abundantly further back at Darjeeling and northwards on rather dry slopes; *Bœhmeria rugulosa* becomes very rare in Sikkim; and *Scutellaria discolor*, to be found in quantity, must be searched for north of the Tista Bridge, *i.e.*, where Pinus appears. The other plants, *e.g.*, *Indigofera hirsuta*, *Maoutia Puya*, *Echinacanthus longistylus*, *Strobilanthes capitatus*, *Mussænda Roxburghii* and *Geniosporum strobiliferum* hold their own in the Sikkim Himalaya; but they do not make any plant association as in Nepál: they associate in these forests of Nepál with plants of Eastern type, so that we have a curiously mixed eastern and western vegetation on the Chorea Gháti belt.

Just north of the pine forests of the Chorea Ghâti come the wetter Sál forests towards Hettaunda. They are very like the Sál forests on the edge of the hills of Sikkim: *Hedyotis scandens*, *Leucas mollissima*, *Callicarpa macrophylla* and *Laggera flava* are common plants in each country; *Anthistiria gigantea* is a characteristic grass in each; and the Leguminosæ are similar, *e.g.*, *Mezoneurum cucullatum*, *Mimosa rubricaulis* and *Acacia pennata*, though they become rare in the Tista valley, north of the Tista Bridge; *Castanopsis indica* is found bordering on the Sál in both places; *Desmodium confertum* is common in the Nepál forests, and locally common in the Sikkim Sál forests, but chiefly above the Tista Bridge. In this damp Sál forest of Hettáunda I found more epiphytic orchids than in the Sál forest of the plain.

Again beyond Hettáunda the tangle of vegetation present in the Bháinsa Duhán gorge is like that of Sikkim. The abundance of trees of the peculiar *Duabanga sonneratioides* and tall *Bombax malabaricum* alone would make the forests in a measure alike: in addition there is the conspicuous creeper *Combretum decandrum* in both places; there is the abundance of *Strobilanthes capitatus* and *Elatostema rupestre*; the presence of *Kalanchoe* on rocks, of *Oroxylum indicum* with its enormous pods, of *Hamiltonia suaveolens*, of *Anthocephalus Cadamba*, of *Terminalia tomentosa*, of *Antidesma diandrum*, and of *Mussænda Roxburghii*. *Pandanus furcatus*, local in the Bháinsa Duhán gorge, is far more abundant in the Tista valley; while the reverse is the case in regard to *Kalanchoe*. *Rhaphidophora glauca* is also more abundant in the Sikkim valleys. *Gynocardia odorata*, which occurs along the Tista valley is apparently absent from the Bháinsa Duhán gorge. *Urtica parviflora* is enormously plentiful in both places, and so is *Ageratum conyzoides*; while *Girardinia heterophylla* is common enough. *Arundina bambusifolia* is equally found in both countries. Associated with *Arundina* in Sikkim and common, is *Exacum teres*, but it was not observed by me in Nepál, though found on the Nepál border near Báirágnia.

In the upper part of the Bháinsa Duhán gorge the similarity to Sikkim continues in the presence of *Rubus ellipticus* and *Colebrookia oppositifolia*. *Holmskioldia sanguinea* is more common in Nepál than in Sikkim. *Thunbergia grandiflora* is absent from Nepál; and *Thunbergia fragrans*, a feature of the hills under Tindhária in Sikkim, seems to be less common in Nepál than in Sikkim.

The abundance of *Nephrolepis tuberosa* at the upper limits of the tropical forest belt is alike in both countries.

The cultivation belt both in Nepál and Sikkim in common is characterised by the abundance of *Schima Wallichii*, *Pteris aquilina*, *Nephrolepis tuberosa*, *Gleichenia dichotoma*, *Drymaria cordata*, *Artemisia vulgaris*, *Bœnninghausenia albiflora*, *Laggera pterodonta*, *Melastoma malabathricum*, *Colocasia Antiquorum* and *Rubus ellipticus*. *Lindenbergia grandiflora*, common in Nepál, is locally common in Sikkim. But whereas in Nepál *Rosa moschata* is most abundant and a feature of the Nepál valley, it is absent from the Sikkim Himalaya—driven out (one must conclude) by the rain. *Oxyspora paniculata* locally abundant in Nepál seems to be rare on the wettest hills of Sikkim, though very common at some distance from the plains.

In the cultivation belt are the downs of Márkhu with plants most unlike those of Sikkim, *e.g.*, *Lotus corniculatus*, *Campanula sylvatica* and *Oldenlandia gracilis*. These grassy downs with their short turf and bushes of *Prinsepia*, *Rosa* and *Rubus* are much more like hill-sides towards Simla than hill-sides towards Darjeeling. High up on them *Gaultheria fragrantissima* makes little fence-like lines in places where the slope of the hill has favoured its growth. *Phyllanthus parvifolius* is there most common; but in British Sikkim I have only seen it in one place.

The upper forest belt is the hardest to write of, because so little of it could be examined. It has been shown how much more eastern than western is its vegetation; its appearance is often more western than eastern—a consequence of the wholesale destruction for firewood to which it is subjected, and which is more a feature of the hills towards Simla than the less populated hills of Sikkim: but this resemblance is fortuitous. The oaks of the upper forest belt along the ridges where they have escaped the axe, the moss that hangs thick on their branches, the trees of *Prunus Puddum* and *Alnus nepalensis*, the bushes of *Luculia*, *Mæsa*, *Neillia thyrsiflora*, *Priotropis cytisoides*, *Dichroa febrifuga*, *Berberis nepalensis* and *Hypericum patulum*, the climbers as *Clematis Buchananiana*, *Rubus paniculatus* and *Hedera Helix*, the patches of *Gleichenia longissima* filling hollows, the abundance of *Swertias*, *Valeriana Hardwickii*, *Hydrocotyle javanica* *Sanicula europæa*, *Geranium nepalense*, *Parochetus communis*, *Gynura angulosa*, *Pratia begonifolia* and *Andropogon assimilis*, are as in Sikkim. But whereas in Sikkim one generally finds several Rhododendrons on the hills where *R. arboreum* grows, one does not do so in Nepál. One of the Nepál oaks *Quercus semecarpifolia*, like several plants mentioned already, avoids the wettest forests of the outer Sikkim Himalaya.

The hills of Nepál show a great poverty, as compared with Sikkim, in the number of species present; but then we know so little of the Nepál hills, and there are doubtless so many plants yet to be found at 7,000 feet and above, that we are hardly justified in drawing deductions.

As far as we know at present, the temperate forest belt contains fewer western types than the cultivation belt, and this we must largely ascribe to our accidental knowledge of the unusually cold and deforested Lohári-Nepál Valley, and to the want of knowledge of anything but damp hill crests in the temperate forest belt.

Summing up, then, we may say of the road into Nepál :—

1. Its Sál forests on the flat are not quite like those of the Sikkim Terai, nor as those of Kheri.
2. The pine forests of the Chorea Gháti are unrepresented in Sikkim, though a few of their plants are distinctly Eastern.
3. The Sál forests of the Hettáunda mári are like the Sál forests of the lower Sikkim Himalayan slopes.
4. The vegetation of the wet gorge of Bháinsa Duhán is very like that of corresponding places in Sikkim.
5. The vegetation of the cultivation belt is rather diverse from that of Sikkim.
6. The vegetation of the wet hill tops is like that of corresponding places in Sikkim.

The similarities noticed are the effect of the monsoon ; and of course one could not expect any barriers to dispersal along the chain other than climatic changes. The wet south-west wind streaming straight up the Bay of Bengal on to the Sikkim Himalaya brings so much rain thither as to drive certain plants out of those hills, chiefly out of the hills that it first strikes, and thereby it creates the diversity of the Sikkim Flora—a most worthy subject for study. Where this same wind in some similar degree strongly blows on to the hills that we are dealing with, their vegetation resembles that of the Sikkim Himalaya.

The known endemic element in our region, as far as it came under my observation, consists of *Blumea obovata* on the Chorea Gháti hills, of three species of *Impatiens*, of *Calamintha longicaulis* and possibly of an *Eriocaulon*—plants not numerous enough in the present state of our knowledge to justify deductions. There are also some varieties which are endemic, among which may be included those of *Inula Cappa* and *Senecio scandens*, mentioned earlier (pp. 68 and 87).

ENUMERATION OF PLANTS OBSERVED.

Those were collected which are numbered or dated: The rest are recorded as growing in the notes made en route. (1) indicates lower forests, (2) cultivation belt, (3) upper forests.

DICOTYLEDONES.

Ranunculaceæ.

Clematis Gouriana Roxb.
(1) Hettáunda. 29544.

Clematis Buchananiana DC.
(2) Chitlong, abundant, 29679:
(3) Saddle on the road near Pherphing.

Clematis grewiaeflora DC.
(1) Below Bhimpedi, 29580:
(3) Chessapáni pass, not uncommon, 29588.

Anemone sp.
(2) Markhu valley: Khágu, west of Pherphing.

Thalictrum sp.
(3) North side of Chándagiri.

Ranunculus sceleratus Linn.
(2) Márkhu valley.

Ranunculus diffusus DC.
(3) North side of Chándagiri pass, 6,000 ft. 29819.

Ranunculus pensylvanicus Linn.
(3) Forest above Chitlong, 29691.

Dilleniaceæ.

Dillenia pentagyna Roxb.
(1) Simalbása: Chorea Gháti above Bichiakoh.

Menispermaceæ.

Cocculus villosus DC.
(1) Parsua, in jungle.

is sampelos Pareira Linn.
(1) Adhabhár to Bichiakoh, in the sál forest, 29473.

Berberidaceæ.

Berberis nepalensis Spreng.
(2) Márkhu valley.
(3) Forest above Chitlong; Fákhel.

Berberis aristata DC.
(3) Forest just above Chitlong, 29696.
Berberis asiatica Roxb.
(2) Márkhu, 3,800-4,000 ft. 29644.

Papaveraceæ.

Argemone mexicana Linn.
(1) Shingle river bed, Bhimpedi.

Fumariaceæ.

Fumaria sp.
(2) Niakot.

Cruciferæ.

Cardamine hirsuta Linn.
(1) Tádi valley near Niakot, 11th December 1907: Likhu valley, rare:
(2) Márkhu.

Violaceæ.

Viola canescens Wall.
(2) Chitlong, 29682.
Viola sp.
(2) Chitlong.

Bixaceæ.

Flacourtia Ramontchi L'Herit.
(1) Parsua.
Xylosma longifolium Clos.
(1) Sángu on Trisuli, 29913.

Polygalaceæ.

Polygala arillata Ham.
(2) Ascent from Thánsing to the Sángli khola, 29943.
Polygala leptalea DC.
(1) By the Kuro nadi, near Hettáunda, 29526.

Caryophyllaceæ.

Cerastium glomeratum Thuill.
(2) Khágu.
Cerastium triviale Link.
(2) Márkhu valley.
Stellaria ? saxatilis Wall.
(2) Márkhu, 4,000 feet, abundant, 29674

Brachystèmma calycinum Don.
(1) Supári tár, very abundant: Nimbua tár, 28161, 28168.

Arenaria ? serpyllifolia Linn.
(2) Chitlong, 29684.

Drymaria cordata Willd.
(1) Hettáunda, 29548 : Pánrán and above, common
(2) Márkhu valley : Chitlong.

Polycarpon Loeflingiæ Benth. & Hook. f.
(1) Tádi valley.

Hypericaceæ.

Hypericum patulum Thunb.
(3) Chessapáni, 5,000-6,000 ft., common, 29597 ; Chándagiri pass, 7,400 ft., 29809.

Hypericum elodeoides Choisy.
(2) Above Márkhu, common on the pastures, 29664.

Hypericum japonicum Thunb.
(1) Thánsing.
(2) Márkhu and above, 4,000-4,500 ft., very abundant, 29671, Khátmándu to
(3) Kakni, common, 29848.

Guttiferæ.

Mesua ferrea Linn.
(1) Planted at Gurkháh in the Tádi valley: called "Náresur," 29928.

Ternstrœmiaceæ.

Cleyera ochnacea DC.
(2) Near Khátmándu, 5th December 1907 : Korkus khola, 29974.

Eurya symplocina Bl.
(2) North descent from Chessápáni pass, 4,500 ft., 29620.

Eurya acuminata DC.
(2) Near Khátmándu, 5th December 1907 :
(3) Forest above Chitlong, 29695 : west of Pherphing : Kakni, 9th December 1907.

Saurauja nepaulensis DC.
(1) Above Bichiakoh to summit of pass, 1,200-1,600 ft., 29494.

Schima Wallichii Choisy.
(2) Thánsing : above Bhimpedi to Sisagárhi, 4,500-6,000 ft., 29581 : near Khátmándu, 5th December 1907 :
(3) Chessápáni pass.

Camellia theifera Griffith.

(2) Thánsing: Thánkot, 5,500 ft., abundant, 29823: near Támbeh Kháni, 3,800 ft., 29630: west of Pherphing in one spot:

(3) Kakni.

Dipterocarpaceæ.

Shorea robusta Gærtn.

(1) Adhabhár to Bichiakoh, the chief tree: Chorea Gháti hills, common: just above Bhimpedi: from half way between the Tádi river and Sinduri to Debi ghát and all round under Niakot, and up the Tádi valley to above Thánsing.

Malvaceæ.

Sida rhombifolia Linn.

(1) Terai, Birganj to Parsua: Bichiakoh village.

Sida carpinifolia Linn.

(1) Simalbása.

Sida cordifolia Linn.

(1) Simalbása.

Urena lobata Linn.

(1) Terai, Birganj to Parsua: Simalbása: Chorea Gháti above Bichiakoh.

Hibiscus cancellatus Roxb.

(1) Simalbása to Bichiakoh, 29436.

Thespesia Lampas Dalz. & Gibs.

(1) Simalbása to Bichiakoh, 29478.

Kydia calycina Roxb.

(1) Simalbása to Bichiakoh, not uncommon, 29443.

Bombax malabaricum DC.

(1) Parsua, Simalbása: Chorea Gháti above Bichiakoh: Hettáunda to Guelbi, very plentiful, 29569.

Sterculiaceæ.

Abroma augusta Linn.

(1) Bichiakoh: Hettaunda.

Tiliaceæ.

Grewia scabrophylla Roxb.

(1) Hettaunda, 29546.

Grewia hirsuta Vahl.

(1) Adhabhár to Bichiakoh, 29464: Shingle river bed, Bhimpedi.

Triumfetta rhomboidea Jacq.
(1) Terai, Birganj to Parsua : Simalbása, 29423.

Corchorus capsularis Linn.
(1) By the Kuro nadi, near Hettáunda, 29535.

Corchorus olitorius Linn.
(1) Gorge north of Hettáunda in its northern part, once : Battár under Niakot.

Elæocarpus Ganitrus Roxb.
(1) Gurkháh on Tádi river, called "Rudrách," 29923.

Linaceæ.

Reinwardtia trigyna Planch.
(1) Chorea Gháti, from Bichiakoh to Hettáunda, very abundant, 29482, 29483 : in the gorge north of Hettáunda, Thánsing :
(2) From close under Chessapáni pass to Márkhu, at the latter place among the stones of bunds between fields.

Reinwardtia tetragyna Planch.
(3) Kakni, 29884.

Geraniaceæ.

Geranium nepalense Sweet.
(2) Márkhu, 4,000 ft., not uncommon, 29650 : Pherphing, abundant, 29964 :
(3) Khágu, abundant.

Oxalis corniculata Linn.
(1) Parsua :
(2) Márkhu valley, common : Khágu.

Impatiens densifolia Hook. f.
(2) Chitlong, 29689.

Impatiens Pershadiana Hook. f.
(2) Jáitpur, 29852 : Khágu.

Impatiens aureola Hook. f.
(3) Sisagárhi, 29982.

Rutaceæ.

Boenninghausenia albiflora Reichb.
(2) Descent from Chessápáni to Márkhu, common, 29595 : between the river Bágmati and Pherphing, very common.
(3) Chessápáni.

Evodia fraxinifolia Hook. f.
(2) Sinduri, under Kákni, 29894.

Zanthoxylum ovalifolium Wight.

(1) Bháinsa Duhán, 29989 :

(2) Over the Bágmati river on the road from Pátan to Pherphing.

Zanthoxylum alatum Roxb.

(2) Common below Márkhu and sparingly above, 29641.

Clausena pentaphylla DC.

(1) Adhabhár to Bichiakoh, common, 29471.

Ochnaceæ.

Ochna pumila Ham.

(1) Adhabhár to Bichiakoh, 29469.

Meliaceæ.

Melia Azadirachta Linn.

(2) Near Khátmándu, 5th December 1907.

Cipadessa fruticosa Blume.

(3) Sisagárhi, 29986.

Heynea trijuga Roxb.

(2) Niakot, called "Akhar tárua," 29910: above Thánsing.

Cedrela Toona Roxb.

(1) Parsua, 29396: Simalbása, 29430.

Olacineæ.

Schoepfia fragrans Wall.

(1) Under the Sangli khola at Thánsing, 29937.

Natsiatum herpeticum Ham.

(1) Gorge north of Hettáunda from Bháinsa Duhán to Pánrán, abundant, 28171, 29571.

Ilicineæ.

Ilex excelsa Wall.

(2) Támbeh Kháni and Márkhu, 3,800 and 4,500 ft., 29635 : near Khátmándu, 5th December 1907 :

(3) Kákni.

Celastraceæ.

Euonymus vagans Wall.

(3) Forest just above Chitlong, 29801.

Celastrus paniculata Willd.

(2) Above Thánsing.

Rhamnaceæ.

Zizyphus Jujuba Lamk.
(1) Parsua : near Adhabhár.

Zizyphus nummularia W. & A.
(1) Below Niakot, 10th December 1907.

Zizyphus Œnoplia Mill.
(2) Near Pherphing.

Zizyphus incurva Roxb.
(2) Near Khátmándu, 5th December 1907.

Zizyphus rugosa Lamk.
(1) Chorea Gháti, from Bichiakoh to Hettáunda.

Ampelidaceæ.

Vitis carnosa Wall.
(1) Simalbása to Adhabhár, 29441.

Vitis semicordata Wall.
(3) From Chitlong to Thánkot, 29688.

Leea sp.
(1) Forest near Simalbása.

Sapindaceæ.

Acer oblongum Wall.
(2) Near Khátmándu, 5th December 1907.

Dobinea vulgaris Ham.
(2) Ascent from Thánsing to Sángli khola, 29953.

Sabiaceæ.

Sabia paniculata Edgew.
(1) Top of Bichiakoh pass, 29516.

Meliosma simplicifolia Walp.
(1) Top of Bichiakoh pass, 28176.

Anacardiaceæ.

Rhus succedanea Linn.
(2) North side of Chessapáni pass, 5,000 ft., 29611.

Rhus Wallichii Hook. f.
(2) Below Chessapáni, 29583.
(3) West of Pherphing.

Mangifera indica Linn.
(1) Planted on roadside, Birganj and in villages near : under Niakot : Gurkháh.

Semecarpus Anacardium Linn. f.

(1) Near Bichiakoh, under the sál trees, 29475.

Spondias axillaris Roxb.

(1) Simalbása to Bichiakoh. 29456.

Leguminosæ.

Priotropis cytisoides W. & A.

(3) North side of Chessapáni pass, 29616.

Crotalaria prostrata Roxb.

(1) Simalbása to Bichiakoh, 29476 :

(2) south of Támbeh Kháni.

Crotalaria acicularis Ham.

(1) Tádi valley near Niakot, 11th December 1907.

Crotalaria alata Ham.

(1) Parsua, 29388 : Simalbása.

Crotalaria albida Heyne.

(1) Top of Bichiakoh pass, 29510.

Crotalaria calycina Schrank.

(1) Simalbása.

Crotalaria sessiliflora Linn.

(1) Near Bichiakoh, 29466 : north face of Chorea Gháti towards Hettáunda : under Niakot :

(2) Márkhu, 4,000 ft., 29659.

Crotalaria sericea Retz.

(1) Simalbása to Bichiakoh, very common, 29460.

Crotalaria tetragona Roxb.

(1) Near Bichiakoh, 29490 : south of Hettáunda.

Crotalaria medicaginea Lamk.

(1) Parsua, 29377.

Trifolium repens Linn.

(3) Kakni.

Lotus corniculatus Linn.

(2) Chitlong.

Parochetus communis Ham.

(1) Thánsing :

(2) Between Thánsing and the Sángii khola, common : Márkhu, common, 29649 : Khágu.

Indigofera linifolia Retz.

(1) Terai, Birganj to Parsua.

Indigofera hirsuta Linn.

(1) Half way between Bichiakoh and the top of the pass, 29499.

Indigofera pulchella Roxb.

(1) From half way down the north slope of the Bichiakoh pass to Hettáunda, 29525.

Indigofera sp.

(3) Kakni, 29880.

Millettia auriculata Baker.

(1) Adhabhár to Bichiakoh, very common, 29462 ; Bichiakoh pass, 29992.

Geissapsis cristata W. & A.

(1) Thánsing.

Uraria hamosa Wall.

(1) Simalbása, 29427.

Alysicarpus rugosus DC.

(1) Between Parsua and Simalbása, very abundant, 29417.

Desmodium confertum DC.

(1) Bichiakoh to Hettáunda, 29485 : Thánsing :

(2) Sinduri 29898.

Desmodium latifolium DC.

(1) Simalbása, 29425.

Desmodium parvifolium DC.

(2) Márkhu, 4,000 ft., 29647.

Desmodium gyroides DC.

(1) Parsua, 29382.

Abrus precatorius Linn.

(1) Parsua.

Abrus pulchellus Wall.

(2) Near Khátmándu, 5th December 1907.

Shuteria vestita DC.

(1) Bháinsa Duhán, 29991 :

(2) Jaitpur to Kakni, 29879.

Dumasia villosa DC.

(1) Bichiakoh pass, 29999.

Mucuna pruriens DC.

(1) Parsua, in the jungle.

Erythrina arborescens Roxb.

(1) Bichiakoh, 29487 : gorge north of Hettáunda, rare.

Spatholobus Roxburghii Benth.

(1) Terai forest, Simalbása to Bichiakoh.

Butea frondosa Roxb.
(1) Terai north of Birganj.

Pueraria phaseoloides Benth.
(1) Parsua, 29381.

Dalbergia Sissoo Roxb.
(1) Chorea Gháti above Bichiakoh, Hettáunda to Bháinsa Duhán, and at Nimbua tar.

Dalbergia volubilis Roxb.
(1) Gorge north of Hettáunda, common, 28172.

Pongamia glabra Vent.
(1) North of Parsua, planted.

Derris scandens Benth.
(1) Bichiakoh, 29486.

Mezoneurum cucullatum W. & A.
(1) Simalbása, 29428 : Pánrán and Guelbi, not uncommon :
(2) Ascent from Thánsing to Sángli khola, 29942.

Cassia Fistula Linn.
(1) Hettáunda : under Niakot.

Cassia occidentalis Linn.
(1) Terai, Birganj to Parsua : Bichiakoh village : below Niakot, 29900 :
(2) Above Bhimpedi : Niakot.

Cassia Sophera Linn.
(1) Terai, Birganj to Parsua : Niakot.

Cassia Tora Linn.
(1) Simulbása : Bichiakoh village : Hettáunda : Niakot.

Cassia mimosoides Linn.
(1) Between Parsua and Simalbasa, sparingly in grass meadow, 29419.

Cassia laevigata Willd.
(2) Between the river Bágmati and Pherphing, very abundant, 29959.

Bauhinia malabarica Roxb.
(1) Parsua to Bichiakoh, 29420 : Chorea Gháti above Bichiakoh : upper part of the gorge north of Hettáunda.

Bauhinia purpurea Linn.
(1) Bichiakoh pass, 29994.

Mimosa pudica Linn.
(1) Between Birganj and Parsua : Simalbása.

Mimosa rubricaulis Lam.
(1) Bichiakoh, 29480 : Kuro nadi and Hettáunda to Supári tár, very common, 28173.

Acacia concinna DC.
(1) Nimbua tár, 29578.

Acacia pennata Willd.
(1) Supári tár, 28174.

Albizzia lucida Benth.
(1) Bhainsa Duhán, 29988.

Rosaceæ.

Prunus Puddum Roxb.
(2) Above the Bágmati on the road from Pátan to Pherphing : north side of Chessapáni pass, 4,500 ft., 29618 :
(3) Forest above Chitlong 29697 : north side of the Sángli khola.

Prinsepia utilis Royle.
(2) Chitlong, abundant, 29678 : between the river Bágmati and Pherphing :
(3) Kakni.

Neillia thyrsiflora D. Don.
(3) North side of Chándagiri pass, 6,500 ft., 29817.

Rubus acuminatus Smith.
(3) Chándagiri pass, 7,400 ft., 29807.

Rubus paniculatus Smith.
(3) Above Chitlong : west of Pherphing : near Kakni, not uncommon, 29881.

Rubus moluccanus Linn.
(2) North descent from Chessapáni, 4,000 ft., 29633.

Rubus niveus Wall.
(1) Hettáunda.

Rubus ellipticus Smith.
(1) From above Bháinsa Duhán to Bhimpedi : But tár under Niakot :
(2) Bhimpedi to Chessapáni pass, 6,000 ft., 29590 : Chitlong, common : over the Bágmati river on the road from Pátan to Pherphing.
(3) West of Pherphing, very common : Kakni.

Fragaria indica Andr.
(1) Trisuli river banks under Niakot :
(2) Támbeh Kháni to Márkhu, 4,000 ft., 29655.

Potentilla fulgens Wall.
(2) Above Márkhu, 4,500 ft., 29665 :
(3) Kakni.

Rosa moschata Mill.

(2) Támbeh Khání, 3,800 ft., 29637 : Chitlong : Valley of Nepál, common :

(3) West of Pherphing.

Pyrus Pashia Ham.

(3) Forest above Chitlong, 29805 : west of Pherphing, very common : Jáitpur to Kakni, 29853 : Sángli khola, common on south hill face.

Stranvæsia glaucescens Lindl.

(2) Near Khátmándu, 5th December 1907.

Crataegus crenulata Roxb.

(3) Near Kakni, common, 29870.

Cotoneaster bacillaris Wall.

(3) Kakni, on the top of the ridge, 9th December 1907.

Saxifragaceæ.

Astilbe rivularis Ham.

(2) Márkhu valley : Khágu, 29973.

Tiarella polyphylla Don.

(3) Kakni.

Hydrangea ? aspera Don.

(3) Fákhel.

Dichroa febrifuga Lour.

(2) North descent from Chessapáni pass and near Márkhu, 4,000-4,500 ft., 29623 : near Khátmándu, 5th December 1907 :

(3) Near Kakni, 29862 : Sángli khola.

Crassulaceæ.

Bryophyllum calycinum Salisb.

(1) Banks of the Trisuli below Niakot, abundant,

(2) Near Pherphing.

Kalanchoe spathulata DC.

(1) Hettáunda to Chessapáni pass, one of the commonest of plants in sunny places, 29561 :

(2) Niakot : between the river Bágmati and Pherphing.

Combretaceæ.

Terminalia Chebula Retz.

(1) About Adhabhár and to Bichiakoh, not uncommon, 29448.

Terminalia tomentosa Bedd.

(1) Chorea Gháti, from Bichiakoh to Hettáunda and on to Nimbua tár, very common at Bháinsa Duhán : Simalbása to Bichiakoh, 29429 : Thánsing on the Likhu, 11th December 1907.

Anogeissus latifolia Wall.
(1) Adhabhár to Bichiakoh, 29474.

Combretum decandrum Roxb.
(1) Chorea Gháti near Bichiakoh : Hettáunda : Bháinsa Duhán, 29990.

Myrtaceæ.

Eugenia Jambolana Lam.
(1) Planted on roadsides, Birganj.

Eugenia sp.
(1) Thánsing :
(2) Nepál : Pherphing.

Melastomaceæ.

Osbeckia chinensis Linn.
(1) About the top of the Bichiakoh pass, abundant, 29509, 28175.

Osbeckia nepalensis Hook.
(1) Parsua, 29399.
(2) Near Támbeh Kháni, 4,000 ft., 29628 : north descent from Chessapáni pass : Jáitpur to Kakni, plentiful, 29857, 29859.

Melastoma malabathricum Linn.
(1) Parsua, 29400 : Likhu valley :
(2) West of Pherphing.

Oxyspora paniculata DC.
(1) Thansing, under the Sángli khola, 11th December 1907 :
(2) Jáitpur to Kakni, 29860.

Lythraceæ.

Ammannia rotundifolia Ham.
(3) Ascent from Jáitpur to Kakni, abundant, 29855.

Woodfordia floribunda Salisb.
(1) Parsua : Thánsing, abundant : gorge north of Hettáunda towards Nimbua tár :
(2) above Thánsing, towards the Sángli khola.

Lagerstrœmia parviflora Roxb.
(1) Parsua, 29385 : Simalbása :
(2) About Sinduri under Kakni, 29892.

Duabanga sonneratioides Ham.
(1) Hettáunda to above Bháinsa Duhán, one of the commonest trees at the latter place, 29987.

Onagraceæ.

Jussiæa repens Linn.
(1) Tájpur, north of Birganj, 29373.

Cucurbitaceæ.

Bryonia laciniosa Linn.
(1) Parsua in jungle, 29393 : Hettáunda :
(2) Between the Bágmati river and Pherphing.

Zehneria umbellata Thwaites.
(1) Adhabhár to Bichiakoh, apparently common enough, 29461.

Mukia scabrella Ham.
(1) Hettáunda.

Begoniaceæ.

Begonia gigantea Wall.
(1) Top of Bichiakoh pass, 29997.

Begonia laciniata Roxb.
(3) Near Kakni, 29882.

Cactaceæ.

Opuntia monacantha Haw.
(1) Shingle river bed, Bhimpedi under Niakot.

Umbelliferæ.

Hydrocotyle javanica Thunb.
(3) Kakni, 9th December 1907.

Hydrocotyle rotundifolia Roxb.
(1) Hettáunda :
(2) Márkhu valley :
(3) Kakni, abundant.

Sanicula europæa Linn.
(3) North side of Chándagiri : Kakni, abundant :
(2) Khágu.

Pimpinella diversifolia DC.
(3) North side of Chándagiri pass, 29814.

Œnanthe stolonifera Wall.
(1) Parsua, apparently rare, 29408.

Heracleum sp.
(3) Forest above Chitlong.

Araliaceæ.

Heteropanax fragrans Seem.

(1) Between Supári tár and Bháinsa Duhán, 29568.

Hedera Helix Linn.

(2) Márkhu valley : near Khátmándu, 5th December 1907

(3) Kakni, 6,500 ft., common, 8th December 1907.

Cornaceæ.

Cornus oblonga Wall.

(3) Just above Thánkot, 5,500 ft., 29822 : Fákhel, west of Pherphing, 29967.

Cornus capitata Wall.

(2) Near Kárgu, very abundant over a short space, 29976 : between Khágu and Támbeh Kháni, rare.

Caprifoliaceæ.

Viburnum stellulatum Wall.

(2) North side of Chessapáni pass, 5,000 ft., 29613, 29614 :

(3) Southern side of Chándagiri pass, 29806 : Khágu, not uncommon.

Viburnum punctatum Ham.

(1) Top of Bichiakoh pass, 16th December 1907.

Viburnum coriaceum Blume.

(2) Near head of Khágu nadi, 29975 : west of Pherphing, plentiful : ridge near Kakni, 29878.

Rubiaceæ.

Anthocephalus Cadamba Miq.

(1) North of Hettáunda.

Adina cordifolia Hook. f.

(1) North of Parsua : Simalbása.

Stephegyne parvifolia Korth.

(1) Chorea Gháti near Bichiakōh.

Hymenodictyon excelsum Wall.

(1) Simalbása to Adhabhár, 29455, 29457.

Luculia gratissima Sweet.

(2) North slope under Chessapáni pass to Márkhu, 3,500-5,000 ft., not uncommon, and plentifully on rocks by the river, 29610 : near Khátmándu, 5th December 1907 : over the Bágmati river on the road from Patan to Pherphing ;

(3) Kakni.

Wendlandia exserta DC.
(1) Parsua.

Wendlandia ? coriacea DC.
(1) Under the Sangli khola at Thánsing, common under sál trees 29934, and
(2) Common above the sál forest.

Wendlandia pendula DC.
(1) Near the Trisuli, by But tár under Niakot, 29902 : Bháinsa Duhán, 29570.

Hedyotis scandens Roxb.
(1) On the north side of Bichiakoh pass about five hundred feet below the summit and thence on through Hettáunda to Pánrán, not uncommon, 29520, 29558.
(2) West of Pherphing, rare.

Oldenlandia corymbosa Linn.
(1) Bank of Trisuli below Niakot, in the sand of the river bank, 29920.

Oldenlandia gracilis DC.
(2) Above Márkhu, 4,200 ft., 29673 : Chitlong, 29680.

Ophiorrhiza fasciculata Don.
(var. With a few hairs on leaves).
(2) Near Khátmándu, 5th December 1907.

Mussaenda Roxburghii Hook. f.
(1) Top of Bichiakoh pass, 29517 : north of Hettáunda.

Randia tetrasperma Roxb.
(3) Sisagárhi, 29984 : Chándagiri pass, 7,400 ft., 29810 : ridge near Kakni, 29876 : Sángli khola.

Randia dumetorum Lamk.
(1) Parsua : Simalbása.

Hyptianthera stricta W. & A.
(1) Under the Sángli khola at Thánsing, not uncommon under sál trees, 29935.

Knoxia corymbosa Willd.
(1) Adhabhár, not uncommon, 29467.

[**Pæderia fœtida** Linn.
Sold in Khátmándu, origin not exactly ascertained, called " Biri, " 29824.]

Hamiltonia suaveolens Roxb.
(1) Hettáunda to Nimbua tár, common, 29579 :
(2) Near Pherphing, plentiful.

Leptodermis lanceolata Wall.
(3) Kakni, abundant, 29887.

Rubia cordifolia Linn.
(2) Between Támbeh Kháni and Markhu, 4,000 ft., 29642 : Chitlong, common : between the river Bágmati and Pherphing abundant, 29960 :
(3) Fakhel.

Rubia angustissima Wall.
(1) Top of Bichiakoh pass, 29993.

Galium rotundifolium Linn.
(3) Between Khárgu and Tambeh Kháni, 29978.

Galium Aparine Linn.
(3) Chessapáni, north side of pass, 5,500 ft., 29607 : Kakni, 9th December 1907. Our Indian plant is a distinct variety.

Galium Mollugo Linn.
(*G. asperifolium* Wall.)
(2) Chessapáni pass, 5,800 ft., 29603 : Kakni. I should prefer to see *G. asperifolum* considered as a species.

Valerianaceæ.

Valeriana Hardwickii Wall.
(3) Chessapáni pass, 29601 : north side of Chándagiri.

Dipsaceæ.

Dipsacus inermis Wall.
(2) Márkhu :
(3) Chessapani pass, not uncommon, 5,500-6,000 ft., 29605 : Chitlong to Thánkot.

Compositæ.

Vernonia teres Wall.
(1) Adhabhár to Bichiakoh, 29459 and 29470 : But tár, south of Niakot, 11th December 1909 :
(2) Niakot, 3,000 ft., 10th December 1907.

Vernonia subsessilis DC.
(1) Top of Bichiakoh pass, 29995.

Vernonia cinerea Less.
(1) Terai, Birganj to Parsua : Simalbása : north side of Chorea Gháti : Pánrán and Guelbi, common : But tár under Niakot :
(2) Nepal Valley.

Vernonia anthelmintica Willd.
(1) Chorea Gháti above Bichiakoh:
(2) Niakot village, 3,000 ft., 10th December 1907.

Elephantopus scaber Linn.
(1) Parsua, common: Simalbása: north side of Chorea Gháti, common.

Adenostemma viscosum Forest.
(1) Parsua, abundant, 29411: Simalbása:
(2) Near Khátmándu, 5th December 1907.

Ageratum conyzoides Linn.
(1) Chorea Gháti above Bichiakoh: top of Bichiakoh pass: Hettaunda, in sheets and in the gorge northwards, common:
(2) Márkhu valley, common.

Dichrocephala latifolia DC.
(3) Sángli khola, 29948.

Myriactis nepalensis Less.
(3) Chessapáni pass, not uncommon, 5,300-6,000 ft., 29604: Kakni.

Erigeron bellidioides Benth.
(2) Above Márkhu, 4,500 ft., 29661: near Khátmándu, 5th December 1907: close to the river Bágmati on the road from Pátan to Pherphing, 29958.

Conyza japonica Less.
(2) Márkhu, 4,000 ft., 29657.

Conyza stricta Willd.
(1) Near the top of Bichiakoh pass, 29504: Pánrán and Guelbi, common: Shingle river bed, Bhimpedi.

Blumea obovata DC.
(1) Top of Bichiakoh pass, 29512.

Blumea procera DC.
(1) Near Thánsing, 29952.

Laggera flava Benth.
(1) Adhabhár to Bichiakoh, very common, 29451: north face of Chorea Gháti: under Niakot: Thansing.

Laggera alata Schultz-Bip.
(1) Nimbua tár, common, 29577: Shingle river bed, Bhimpedi: under Niakot:
(2) South of Khágu.

Laggera pterodonta Benth.
(2) Near Khátmándu, 5th December 1907.

Anaphalis triplinervis C. B. Clarke.

(2) Above Márkhu, 4,500 ft., 29666.

Anaphalis cinnamomea C. B. Clarke.

(3) Chessapáni, 6,000 ft., not common, 29594: Kakni, near the bungalow, at 6,500 ft., common, 9th December 1907.

Anaphalis adnata DC.

(3) North of Sángli khola, 12th December 1907.

Anaphalis araneosa DC.

(1) Near top of Bichiakoh pass, 29505: Shingle river bed, Bhimpedi:

(2) Niakot, 10th December 1907:

(3) Sángli khola, 12th December 1907.

Anaphalis contorta Hook. f.

(2) Chessapáni to Márkhu, 3,500-6,000 ft., common, 29602:

(3) west of Pherphing, common.

Gnaphalium luteo-album Linn.

(2) Márkhu valley: Chitlong.

Cæsulia axillaris Roxb.

(1) Terai, north of Birganj: rice fields along the Tárdi river.

Inula Cappa DC. (*I. eriophora* DC).

(1) From a little above Bichiakoh to 4 miles short of Hettáunda, 29495. *I. eriophora* appears to be a good variety.

Vicoa auriculata Cass.

(1) But tár under Niakot: Thánsing.

Siegesbeckia orientalis Linn.

(1) Hettáunda:

(2) Chitlong.

Eclipta alba Hassk.

(1) Parsua: Trisuli river banks, under Niakot.

Spilanthes Acmella Linn.

(1) Hettáunda: Nimbua tár, common:

(2) Márkhu valley.

Bidens pilosa Linn.

(1) Bichiakoh to Hettáunda, common, 29491.

Cosmos sulfureus Cav.

(1) Hettáunda, by the river, 29542.

Glossogyne pinnatifida DC.

(1) But tár under Niakot.

Chrysanthellum indicum DC.
(1) Tájpur, north of Birganj, 29374: Parsua in jungle.

Galinsoga parviflora Cav.
(1) Fields near the Tádi river, rare:
(2) Chessapáni pass to Márkhu: Chitlong, abundant:
(3) Kakni.

Artemisia parviflora Roxb.
(2) Above Márkhu, 4,500 ft., 29670.

Artemisia vulgaris Linn.
(1) Near the top of Bichiakoh pass, 29502: Hettáunda, very abundant, and onwards to Bhimpedi:
(2) Márkhu valley: between Pátan and Pherphing:
(3) Forest above Chitlong.

Gynura angulosa DC.
(3) North slope under the Sángli khola, 29949.

Emilia sonchifolia DC.
(1) Parsua, 29414.

Senecio chrysanthemoides DC.
(2) Above Támbeh Khâni, very rare, 29638.

Senecio scandens Wall. (*S. flexuosus* Wall.).
(3) Forest above Chitlong, 29690: below Kakni towards Níakot: Sángli khola.

Senecio densiflorus Wall.
(3) North side from Chessapáni pass, 29622: below Kakni towards Niakot, 9th December 1907.

Senecio vagans Wall.
(2) Near Khátmándu, 5th December 1907:
(3) North side of Chándagiri pass, 6,000 ft., 29818: north side of Chessapáni pass, 5,000 ft., 29615.

Cnicus argyracanthus DC.
(2) Márkhu.

Cnicus Wallichii DC., var. **nepalensis** Hook. f.
(3) Summit of Chándagiri pass, 7,700 ft., 29812.

Ainsliæa pteropoda DC.
(3) Kakni, on the Niakot side of the watershed, 6,000 ft., 9th December 1907.

Ainsliæa aptera DC.
(3) Sisagárhi, 29983.

Gerbera macrophylla Benth.
(3) Chessapáni pass, common, 29593.

Picris hieracioides Linn.
(2) Near Támbeh Kháni, 29639.

Lactuca hastata DC.
(3) North side of Chándagiri pass, and summit 29811, 29815.

Sonchus arvensis Linn.
(2) Márkhu, 29676.

Launæa nudicaulis Less.
(2) Jáitpur, 29849.

Tagetes patula Linn.
(2) About Kuli Kháni on the road to Chessapáni, 4,500 ft., 29619.

Campanulaceæ.

Pratia begonifolia Lindl.
(3) North side of Chessapáni pass, 5,000 ft., 29612 : Kakni : Sángli khola.

Lobelia trigona Roxb.
(1) Parsua, 29413 : by the Kuro nadi near Hettáunda, 29534.

Lobelia radicans Thunb.
(2) Near Khátmándu, 5th December 1907.

Lobelia pyramidalis Wall.
(3) Between Kakni and Sinduri, 29,897.

Wahlenbergia gracilis DC.
(1) Under the Sángli khola at Thánsing, 29929.

Campanumæa inflata C. B. Clarke.
(3) Kakni, 9th December 1907.

Campanula sylvatica Wall.
(2) Márkhu, 4,000-4,500 ft., 29653 : near Pherphing.

Campanula colorata Wall.
(3) North side of Chessapáni pass : Chitlong to Thánkot, common, 29685.

Ericaceæ.

Gaultheria fragrantissima Wall.
(2) Above Márkhu, 4,500 ft., 29663 :
(3) Kákni, abundant, 9th December 1907 : Sángli khola.

Pieris ovalifolia Don.

(2) Under Kákni towards Niakot, 29891 : upper edge of the sál forest near Thánsing : over the Bágmati river on the road from Pátan to Pherphing :

(3) West of Pherphing, abundant, called "Ayeri," 29966 : Chessapáni south of Khágu, very abundant.

Rhododendron arboreum Sm.

(2) On the downs near Chitlong :

(3) Chessapáni pass, 5,000-6,000 ft., common, 29585 : Chándagiri pass, 7,400 ft., and below, 29808 : west of Pherphing, very abundant : alone crowning a hill top south of Khágu.

Plumaginaceæ.

Plumbago zeylanica Linn.

(1) South side of Bichiakoh pass : Nimbua tár :

(2) Near Khátmándu, 5th December 1907 : between the river Bágmati and Pherphing.

Primulaceæ:

Androsace saxifragæfolia Bunge.

(2) Close to the river Bágmati on the road from Pátan to Pherphing, 29956.

Myrsinaceæ.

Mæsa ramentacea A. DC.

(2) Under Kákni along the road to Niakot, 4,00-6,000 ft., 9th December 1907 : Niakot :

(3) Kákni : Sángli khola : west of Pherphing.

Mæsa macrophylla Wall.

(2) Under Kakni towards Niakot, 29890 :

(3) Sángli khola, 12th December 1907.

Myrsine africana Linn.

(2) On the downs above Márkhu, in sheltered corners, 29677

Myrsine semiserrata Wall.

(2) Near Khátmándu, 5th December 1907 : ascent from Thansing to the Sángli khola, 29994 :

(3) Sángli khola, 12th December 1907.

Myrsine capitellata Wall.

(2) Near Khátmándu, 5th December 1907 :

(3) Jáitpur to Kakni, 29,868.

Embelia Ribes Burm.

(2) Near Khátmándu, 5th December 1907.

(3) North side of Chándagiri pass, 5,500-6,000 ft., 29820, 29821.

Embelia robusta Roxb.

(1) Half way between the top of the Bichiakoh pass and Hettáunda, 29523.

Ardisia humilis Vahl.

(1) Thánsing :

(2) Niakot, 29908.

Styraceæ.

Symplocos spicata Roxb.

(1) North of Adhabhár to Bichiakoh, common in sál forest, 29468 : north side of Chorea Gháti towards Hettáunda.

Symplocos theæfolia Ham.

(2) Near Khátmándu, 5th December 1907 : Jáitpur to Kakni, very common, 29867 :

(3) Kakni, 6,000 ft., 9th December 1907.

Oleaceæ.

Jasminum humile Linn.

(2) Khágu.

(3) Chándagiri :

Nyctanthes Arbor-tristis Linn.

(1) Near Bichiakoh, 29477 :

(2) Bhimpedi to Sisagárhi.

Fraxinus floribunda Wall.

(2) Near Khátmándu, 5th December 1907.

Ligustrum nepalense Wall.

(2) Támbeh Kháni, 3,800 ft., common, 29636.

Apocynaceæ.

Tabernæmontana coronaria R. Br.

(1) Bháinsa Duhán, 29572.

Trachelospermum fragrans Hook. f.

(3) Forest above Chitlong 29700.

Ichnocarpus frutescens R. Br.

(1) North of Parsua between Adhabhár and Biahiakoh, rare.

Asclepiadaceæ.

Calotropis procera R. Br.

(1) Banks of Trisuli below Niakot : banks of the Tádi.

Loganiaceæ.

Buddleia sp.

(Almost certainly *B. macrostachya* Benth.)

(3) Forest above Chitlong, 29698.

Buddleia asiatica Lour.

(2) Márkhu, 4,000 ft., 29645.

Gentianaceæ.

Exacum teres Wall.

(1) Bichiakoh, 29481.

Exacum tetragonum Roxb.

Canscora decussata Roem. & Sch.

(1) Adhabhár to Bichiakoh: Chorea Gháti, not infrequent.

(1) Between Parsua and Simalbása, common, 29418.

Gentiana decemfida Ham.

(1) Bank of Trisuli below Niakot, common, 29918.

Gentiana capitata Ham.

(2) Chitlong, 29681.

Gentiana pedicellata Wall.

(2) Half way down the hill from Kakni to the Tádi valley, 10th December 1907: Jáitpur, near Khátmándu, 29846.

Swertia paniculata Wall.

(2) Between Kargu and Támbeh Kháni, 29980: Márkhu, 4,000 ft., 29646; and var. *brachypetala* Griseb:

(2) Márkhu, 4,000 ft., 29646, 29660: above Márkhu, 4,500 ft., 29672: between Kargu and Támbeh Kháni, 29979:

(3) Edge of forest above Chitlong, very common, 29699.

Swertia dilatata C. B. Clarke.

(2-3) Jáitpur to Kakni, excessively common, 29854, 29873: north of pass Sángli khola, 12th December 1907.

Swertia nervosa Wall.

(3) Above Jáitpur, 29869 Chessapáni, 6,000 ft., 29586: Sángli khola.

Swertia angustifolia Ham. var. **Wallichii** Burkill.

(1) South and north slopes of Bichiakoh pass, 29496, 29522: Hettáunda to Supári tár, 29584: south of Bhimpedi:

(2) Márkhu and above: above Thánsing to the Sángli khola, 12th December 1907.

Hydrophyllaceæ.

Hydrolea zeylanica Vahl.

(1) Terai, Birganj to Parsua: Kuro nadi.

Boraginaceæ.

Trichodesma indicum R. Br.

(1) Parsua, in jungle : Simalbása.

Cynoglossum furcatum Wall.

(1) By the Trisuli under Niakot, 29901 :

(2) Ascent from Thánsing to Sangli khola, 29947 :

(3) Chessapáni pass, 5,800 ft., 29598.

Cynoglossum lanceolatum Forsk.

(1) Between Birganj and Parsua.

Bothriospermum tenellum Fisch. & Mey.

(2) Chitlong, 29687.

Convolvulaceæ.

Rivea ornata Chois.

(1) Adhabhár to Bichiakoh, 29472.

Argyreia Hookeri C. B. Clarke.

(1) Simalbása to Bichiakoh, not uncommon, 29440.

Lettsomia setosa Roxb.

(1) Parsua, in jungle, 29386.

Ipomoea Bona-nox Linn.

(1) Hettáunda.

Ipomoea hederacea Jacq.

(1) Hettáunda, 29549.

Evolvulus alsinoides Linn.

(1) Parsua, in jungle : But tár under Niakot.

Porana paniculata Roxb.

(1) Bichiakoh, 29479 : Supári tár : Nimbua tár, 28170.

Cuscuta reflexa Roxb.

(2) North slope of hill side under Chessapáni pass, 5,000 ft., 29608.

(3) Forest above Chitlong, 29804 : Kakni.

Solanaceæ.

Solanum verbascifolium Linn.

(1) Simalbása, at edge of forest : between Nimbua tár and Bhimpedi.

Solanum indicum Linn.

(1) Gorge north of Hettáunda, common : Shingle river bed, Bhimpedi, plentiful :

(2) West of Pherphing.

Solanum xanthocarpum Schrad. & Wendl.

(1) Terai, Birganj to Parsua : near Adhabhár : Shingle river bed, Bhimpedi :

(2) Márkhu valley.

Nicandra physaloides Gærtn.
(1) Hettáunda :
(2) Chitlong.

Datura Stramonium Linn.
(1) Shingle at Bhimpedi :
(2) Márkhu valley, plentiful : Pherphing.

Datura fastuosa Linn.
(1) Shingle at Bhimpedi :
(2) Niakót, called "Kala Dhatura," 29911.

Scrophulariaceæ.

Verbascum Thapsus Linn.
(2) Márkhu valley.

Mazus rugosus Lour.
(1) Fields along the Likhu.

Lindenbergia grandiflora Benth.
(1) Bichiakoh to the top of the pass and to Hettáunda, 29493. Hettáunda Sángli khola :
(2) Under Kakni towards Niakot, 29889 : descent from Chessapáni pass to Márkhu :
(3) North side of Chándagiri Sángli khola, 12th December 1907 : over the Bágmati on the road from Pátan to Pherphing.

Lindenbergia philippensis Benth.
(2) Márkhu, 4,000 ft., 29654.

Lindenbergia urticaefolia Lehm.
(1) Tárdi valley near Niakot, 11th December 1907 :
(2) Chitlong, 29686.

Limnophila conferta Benth.
(1) Under Sángli khola at Thánsing, [illegible]930.

Limnophila sessiliflora Blume.
(1) Tájpur, north of Birganj, 29370.

Herpestis Monniera H. B. K.
(1) Among rice fields under Niakot.

Torenia vagans Roxb.
(1) Hettáunda to Guelbi, 29556.

Vandellia crustacea Benth.
(2) Khátmándu to Jáitpur 29850,

Scoparia dulcis Linn.
(1) Near Raksál on the banks of the boundary stream, 29363 : Parsua : near Adhabhár : Bichiakoh village.

Hemiphragma heterophyllum Wall.
(3) Kakni, 9th December 1907.

Veronica Anagallis Linn.
(2) Márkhu valley: Khágu.

Orobanchaceæ.

Aeginetia indica Roxb.
(1) Top of Bichiakoh pass, 29513.

Lentibulariaceæ.

Utricularia bifida Linn.
(2) Jáitpur near Khátmándu, 29845.

Utricularia orbiculata Wall.
(1) Supári tár, near Hettáunda, 29560.

Bignoniaceæ.

Oroxylum indicum Vent.
(1) Bichiakoh: gorge north of Hettáunda:
(2) Near Khátmándu, 5th December 1907.

Stereospermum suaveolens DC.
(1) Bichiakoh: near Hettaunda.

Pedaliaceæ.

Martynia diandra Glox.
(1) Bichiakoh village.

Acanthaceæ.

Thunbergia fragrans Roxb.
(2) North descent from Chessapáni pass, 4,500 ft., 29625.

Thunbergia coccinea Wall.
(1) Close to the top of Bichiakoh pass, 29508: north parts of gorge. north of Hettáunda, 3,000 ft:
(2) Half way between Kakni and the Tádi river.

Hygrophila polysperma T. Anders.
(1) Parsua, 29389.

Echinacanthus attenuatus Nees.
(1) By the Kuro nadi near Hettáunda, 29527.

Echinacanthus longistylus C. B. Clarke.
(1) Just on the south side, near the top of the Bichiakoh pass, 29506.

Dædalacanthus nervosus T. Anders.
(1) ar Adhabhár, 29447: Chorea Gháti above Bichiakoh.

Hemigraphis latebrosa Nees.

(2) North descent from Chessapáni pass, 4,500 ft., 29627.

Aechmanthera Wallichii Nees.

(1) Half way between Bichiakoh and the top of the pass, 29498 :
(2) Márku, 4,000 ft., abundant, 29675 dry slopes near Khágu :
(3) West of Pherphing, common over a short space, 29972 :

Strobilanthes Sabinianus Nees.

(1) Supári tár to pánrán, common, 29562, 29563.

Strobilanthes glutinosus Grah.

(3) Chessapáni pass, 6,000 ft., 29592.

Strobilanthes capitatus T. Anders.

(1) Top of Bichiakoh pass, 29515 : Supári tár to Pánrán, common, 29564, 29565 : by the Kuro nadi, near Hettáunda, 29530.

Strobilanthes pentstemonoides T. Anders.

(2-3) Jáitpur to Kakni, 29856.

Barleria cristata Linn.

(1) Simalbása to Bichiakoh, common in the sál forest, 29444 : Chorea Gháti, rare.

Asystasia macrocarpa Nees.

(1) By Kuro nadi, near Hettáunda, 29536.

Lepidagathis hyalina Nees.

(1) Bháinsa Duhán, 29574.
(2) Ascent from Thánsing to Sángli khola, 29945.

Adhatoda vasica Nees.

(1) In the gorge north of Hettáunda : Guelbi to Bhimpedi :
(2) Márkhu valley Niakot : between the river Bágmati and Pherphing, plentiful.

Rungia parviflora Nees.

(1) Birganj to Bichiakoh, especially common in the forest, 29426 : Chorea Gháti : Thánsing under Sángli khola, common under sál trees, 11th December 1907 :
(2) Márkhu, 4,000 ft., 29648.

Dicliptera Roxburghiana Nees.

(3) Forest above Chitlong, 29694.

Dicliptera bupleuroides Nees.

(1) Gorge north of Hettáunda common :
(2) Near Pherphing.

Peristrophe bicalyculata Nees.

(1) Near Adhabhár.

Verbenaceæ.

Callicarpa macrophylla Vahl.

(1) Hettáunda by the river, 29541 : Pánrán and Guelbi to Bhimpedi, abundant : banks of the Trisuli under Niakot.

Gmelina arborea Linn.

(1) Bichiakoh to Hettáunda, 29521.

Vitex ? trifolia Linn. f.

(1) Under Niakot.

Clerodendron serratum Spreng.

(1) Banks of Trisuli below Niakot.

Clerodendron infortunatum Gærtn.

(2) Chitlong : Niakot : Pherphing.

Clerodendron Siphonanthus R. Br.

(1) From down the Chorea Gháti between Bichiakoh pass to Hettáunda, not uncommon, 29524.

Holmskioldia sanguinea Retz.

(1) Hettáunda to Bhimpedi, plentiful, 29551 : over the Trisuli at Battár near Niakot :

(2) Bhimpedi to Chessapáni, plentiful.

Labiatæ.

Ocimum gratissimum Linn.

(1) Near Parsua on the south side, 29375.

Geniosporum strobiliferum Wall.

(1) Top of Bichiakoh pass, 29518.

Plectranthus Gerardianus Benth.

(1) Hettáunda to Bhimpedi, common, 29553 :

(2) Chitlong, rare : south of Khágu.

Plectranthus striatus Benth.

(1) Hettáunda to Supári tár, very common, 29555 : under the Sángli khola at Thánsing, 29938

Plectranthus ternifolius Don.

(1) Parsua, 29376 : between the Bichiakoh pass, and Hettáunda, very common.

Coleus barbatus Benth.

(2) Between Khágu and Támbeh Kháni, 29977.

Pogostemon glaber Benth.

(2) North face under Sángli khola, 29954 : below Kakni, very common, 9th December 1907.

Pogostemon sp.

(1) By the Kuro nadi near Hettáunda.

Dysophylla cruciata Benth.
(1) Under the Sángli khola at Thánsing, 29939.

Colebrookia oppositifolia Smith.
(1) North of Parsua: gorge north of Hettáunda to Bhimpedi: Battár under Niakot:
(2) Márkhu valley.

Elsholtzia ? strobilifera Benth.
(3) Kakni.

Elsholtzia blanda Benth.
(2) Below Kakni towards Niakot, very common, 9th December 1907.

Mosla dianthera Maxim.
(1) By the Kuro nadi near Hettáunda, 29532.

Mentha arvensis Linn.
(1) Nimbua tár:
(2) Márkhu valley.

Micromeria biflora Benth.
(2) Khátmándu to Jáitpur, very abundant, 29847: Márkhu.

Calamintha umbrosa Benth.
(3) Chessapáni pass, 5,800 ft. 29599.

Calamintha longicaulis Benth.
(2-3) Jáitpur to Kakni, 29858.

Scutellaria discolor Coleb.
(1) Top of Bichiakoh pass, 29511.
(2) Near Khátmándu, 5th December 1907.

Scutellaria angulosa Benth.
(1) Hettáunda, common.

Scutellaria repens Ham.
(1) Top of Bichiakoh pass, 29507:
(2-3) Above Bhimpedi to Chessapáni pass.

Scutellaria rivularis Wall.
(1) Below Niakot, 10th December 1907.

Prunella vulgaris Linn.
(2) Khágu.

Craniotome versicolor Reichb.
(2) Near Khátmándu, 5th December 1907:
(3) Chessapáni pass, 5,800 ft., 29600.

Anisomeles ovata R. Br.
(1) Parsua, 29391: Simalbasa:
(2) Between the river Bágmati and Pherphing.

Colquhounia coccinea Wall.
(2) Near Támbeh Khání, 3,800 ft., 29631.

Leucas mollissima Wall.
(1) Bichiakoh to Hettaunda. frequent, 29497.

Leucas ciliata Benth.
(3) North side of Chándagiri pass, 7,700 ft., 29816.

Leucas Cephalotes Spreng.
(2) Márkhu, 4,000 ft., 29656.

Leucas hyssopifolia Benth.
(1) Parsua, 29387.

Leucas linifolia Spreng.
(1) Terai, Birganj to Parsua, plentiful.

Leonotis nepetæfolia R. Br.
(1) Parsua, 29398 : Chorea ghâti.

Teucrium quadrifarium Ham.
(2) Above Márkhu, 4,500 ft., 29669.

Plantaginaceæ.

Plantago major Linn.
(1) Nimbua tár :
(2) Above Támbeh Khâni towards Chessapáni :
(3) Sisagárhi, 29985.

Nyctaginaceæ.

Bœrhaavia repens Linn.
(1) Hettáunda, 29,547 : gorge north of Hettáunda, near Nimbua tár.

Amarantaceæ.

Deeringia celosioides R. Br.
(1) Near Bichiakoh, 29488 :
(2-3) Chessapáni north side of pass, about 5,600 ft., 29596.

Amarantus spinosus Linn.
(1) Parsua : Bichiakoh village :
(2) Chitlong between Khágu and Támbeh Kháni.

Cyathula tomentosa Moq.
(2) Bhimpedi to Márkhu, 4,000—6,000 ft., abundant, 29591.

Cyathula capitata Moq.
(1) Banks of the Trisuli under Niakot, 28181 :
(2) Between Khágu and Támbeh Kháni, 29981.

Achyranthes aspera Linn.
(1) Simalbása : Chorea Ghâti, common.

Alternanthera sessilis R. Br.
(1) Terai, Birganj to Simalbása:
(2) Márkhu.

Chenopodiaceæ.

Chenopodium ambrosioides Linn.
(1) Shingle at Bhimpedi:
(2) Niagáon between Khágu and Támbeh Kháni.

Polygonaceæ.

Polygonum tomentosum Willd.
(1) Parsua, 29407.

Polygonum glabrum Willd.
(1) Terai, Birganj to Parsua.

Polygonum barbatum Linn.
(1) Under the Sángli khola at Thánsing, 29936.

Polygonum Hydropiper Linn.
(1) Terai, Birganj to Parsua:
(2) Near Khátmándu, 5th December 1907.

Polygonum flaccidum Meissn.
(1) By Kuro nadi near Hettáunda, 29529.

Polygonum capitatum Ham.
(1) Supári tár to Bhimpedi, 29566:
(2) Márkhu, common: below Chessapáni, common on dry places about the hill, 29589.

Polygonum chinense Linn.
(1) Near Bichiakoh, 29492: Sángu on the Trisuli, 29914:
(2) North descent from Chessapáni pass.

Polygonum mite Schrank.
(1) Hettáunda to Bhimpedi, very common, 29557: by Kuro nadi near Hettáunda, 29528.

Piperaceæ.

Piper nepalense Miq.
(1) Top of Bichiakoh pass, 29996: Bháinsa Duhán, 29575.

Peperomia reflexa Dietr.
(3) Near Fákhel, west of Pherphing, 29970: north side of Chessapáni pass, 5,500, not abundant, 29609.

Laurineæ.

Litsæa oblonga Wall.
(2) Near Khátmándu, 5th December 1907: near Támbeh Kháni, 3,800 ft., 29634.

Litsæa lanuginosa Nees.
(2) Near Khátmándu, 5th December 1907.

Daphnidium bifarium Nees.
(2) Near Khátmándu, 5th December 1907.

Tetranthera glauca Wall.
(1) Parsua, 29392.

Thymelæaceæ.

Daphne cannabina Wall.
(2) Near Khátmándu, 5th December 1907:
(3) Kakni, at 6,500 ft., along the summit of the ridge, 29872.

Elæagnaceæ.

Elæagnus latifolia Linn.
(2) Close to the river Bágmati on the road from Pátun to Pherphing, 29957.

Loranthaceæ.

Loranthus odoratus Wall.
(3) Above Jáitpur, 29864.

Loranthus Scurrula Linn.
(1) Parsua, on *Flacourtia*, 29384:
(3) Above Jáitpur, 29865.

Loranthus longiflorus Desrouss.
(1) Parsua, 29378.

Loranthus umbellifer Schultz.
(3) Above Jáitpur, 29863.

Viscum monoicum Roxb.
(1) Parsua, 29379: Gurkháh in the Tárdi valley, abundant, 29926.

Viscum articulatum Burm.
(3) Forest above Chitlong, 29803.

Santalaceæ.

Osyris arborea Wall.
(3) Near Kakni, not uncommon, 29861.

Euphorbiaceæ.

Euphorbia pilulifera Linn.
(1) Terai, Birganj to Parsua: Chorea Gháti, not uncommon.

Euphorbia neriifolia Linn.
(1) Near Parsua in hedges: Hettaunda, below Niakot, 29915:
(2) Márkhu valley.

Euphorbia Tirucalli Linn.
(1) Under Niakot.

Euphorbia near E. pilosa Linn.
(2) Chitlong, plentiful, 29683.

Sarcococca pruniformis Lindl.
(2) Támbeh Khani to Márkhu, 3,500—4,000 ft., very common, 29629, 29643: near Khátmándu, 5th December 1907.

Bridelia retusa Spreng.
(1) Parsua, 29383: Simalbasa: Hettáunda, very abundant.

Andrachne cordifolia Muell.-Arg.
(2) Jáitpur near Khátmándu, 29851.

Phyllanthus Emblica Linn.
(1) Simalbása: north face of Chorea Gháti towards Hettáunda, common: above Bhimpedi: under Niakot.

Phyllanthus urinaria Linn.
(1) Tájpur, north of Birganj, 29372.

Phyllanthus parvifolius Ham.
(2) Márkhu, 3,500—4,000 ft., very common, 29651: Pherphing, common, west of Pherphing, common:
(3) Kakni, common, 29885, west of Pherphing, common.

Breynia patens Benth.
(1) Hettáunda, 29543.

Antidesma diandrum Roth.
(1) Adhabhár to Bichiakoh, plentiful, 29453: Chorea Gháti above Bichiakoh, rare: gorge north of Hettáunda.

Jatropha Curcas Linn.
(1) Parsua: Hettáunda: banks of the Trisuli under Niakot:
(2) Sinduri village above the Tádi river:
(3) Niakot.

Mallotus philippensis Muell.-Arg.
(1) Parsua, plentiful, 29390: Simalbása.

Urticaceæ.

Celtis australis Linn.
(2) Márkhu.

Trema orientalis Blume.
(1) Parsua, not uncommon, 29415.

Streblus asper Lour.
(1) Simalbása.

Ficus religiosa Linn.
(1) Planted on roadsides, Birganj : under Niakot :
(2) Tádi valley, just above the sál forest near Sinduri.

Ficus Cunia Ham.
(1) Parsua : Thánsing.

Ficus glomerata Roxb.
(1) Parsua.

Ficus pyriformis Hook. & Arn., var. **subpyriformis** Miq.
(1) Bank of Trisuli below Niakot, 29921.

Ficus lævis Blume (*F. Emodi* Wall.)
(1) Gurkháh on Tádi river, 29924.

Ficus scandens Roxb.
(1) Top of Bichiakoh pass, 29514.

Urtica parviflora Roxb.
(1) Simalbása, 29,424: top of Bichiakoh pass in abundance: Hettáunda, abundant, and in the gorge northwards :
(2) Bhimpedi to Sisagárhi : Márkhu valley : Chitlong : Niakot :
(3) Sisagárhi to Chessapáni pass.

Girardinia heterophylla Decne.
(1) Gorge north of Hettáunda :
(3) Forest above Chitlong.

Pilea anisophylla Wedd.
(2) North slope under Sángli khola, 29950.

Lecanthus Wightii Wedd.
(2) Near Khátmándu, 5th December 1907 : above Thánsing towards the Sángli khola, in the gorge.

Elatostema rupestre Wedd.
(1) Hettáunda, in the gorge, 29554.

Elatostema lineolata Wight.
(2) Khátmándu to Jáitpur, very common, 29844 : above Thánsing towards the Sángli khola.

Boehmeria rugulosa Wedd.
(1) South side of Bichiakoh pass, 1,400 ft., 29503 : gorge north of Hettáunda.

Boehmeria platyphylla Don, var. **macrostachya** Wedd.
(1) Bichiakoh to Hettáunda, not uncommon, 29489.

Maoutia Puya Wedd.

(1) Half way between Bichiakoh and the top of the pass, 29500: gorge above Bhainsa Duhán.

Myricaceæ.

Myrica Nagi Thunb.

(1) Gurkháh in Tádi valley, called "Káphul," 29927.

Cupuliferæ.

Alnus nepalensis Don.

(2) Near Khátmándu, 5th December 1907:

(3) Fakhel.

Quercus semecarpifolia Smith.

(2) Above Jáitpur: south of Khágu, very abundant:

(3) Chessapáni, 6,000 ft., 29587: forest above Chitlong: west of Pherphing, abundant: Kakni.

Quercus lanuginosa Don.

(2-3) Bhimpedi to Chessapáni, 4,500-5,800 ft., 29582.

Quercus glauca Thunb.

(2-3) Between Fákhel and Khágu, 29971:

(3) North side of Chándagiri pass, 7,700 ft., 29813 above Jáitpur, 29866.

Castanopsis indica A. DC.

(2) Niakot: on the ascent from Thánsing to the Sángli khola, called "Dalne Koruth," 29907.

Carpinus viminea Wall.

(2) North descent from Chessapáni pass, 4,500 ft., 29621: Chitlong:

(3) Fákhel.

Salicaceæ.

Salix tetrasperma Roxb.

(1) Parsua, 29380:

(2) Near Khátmándu, perhaps planted.

Ceratophyllaceæ.

Ceratophyllum demersum Linn.

(2) Pherphing, 29963.

MONOCOTYLEDONES.

Hydrocharidaceæ.

Hydrilla verticillata Casp.
(2) Pherphing, 29961.

Orchidaceæ.

Oberonia iridifolia Lindl.
(1) Hettáunda, 29539.
? Eria
(1) Hettáunda, 29538.
Arundina bambusifolia Lindl.
(1) Supári tár.
Otochilus alba Lindl.
(1) Supári tár, 29567:
(3) Chessapáni, very common, 5,000-6,000 ft., 29606.
Otochilus sp.
(1) South side of Hettáunda.
Rhynchostylis retusa Blume.
(1) Under Niakot, common, 29906.
Vanda parviflora Lindl.
(1) Simalbása to Bichiakoh, 29437.
Saccolabium papillosum Lindl.
(1) By Kuro nadi near Hettáunda, 29531.
Zeuxine sulcata Lindl.
(1) Banks of Trisuli, below Niakot, 10th December 1907.

Scitaminaceæ.

Costus speciosus Smith.
(1) Near Adhabhár,
Alpinia ?
(1) Simalbása.

Iridaceæ.

Pardanthus chinensis Ker.
(3) Kakni, common, called "Mangwájar," 29893.

Amaryllidaceæ.

Agave Vera-Cruz Mill.
(2) Under Niakot: Márkhu in plenty: towards Pherphing:
(3) Fákhel, west of Pherphing.

Agave Wightii Drummond & Prain.
(2) Above Thánsing towards the Sángli khola :
(3) Fákhel.

Dioscoreaceæ.

Dioscorea dæmona Roxb.
(1) Adhabhár to Bichiakoh, 29450.

Dioscorea pentaphylla Linn.
(1) Adhabhár to Bichiakoh, 29463 : Hettáunda.

Dioscorea anguina Roxb.
(1) Near Adhabhár, 29445 : Hettáunda, common.

Dioscorea glabra Roxb.
(1) Near Adhabhár, 29446 : Hettáunda, 29537

Dioscorea bulbifera Linn.
(1) Parsua in jungle, 29394 : Simalbása to Bichiakoh : gorge north of Hettáunda almost to Bhimpedi, common, 28177.

Dioscorea belophylla Voigt.
(1) Near Adhabhár, abundant, 29449 : north of Bichiakoh, once : north of Bichiakoh pass 29519 :
(2) Above Thánsing towards the Sángli khola : north side of Chessapáni pass 4,500 ft., 29617 : Sinduri under Kakni, called "Ban Torul," 29896.

Dioscorea sikkimensis Prain & Burkill.
(1) Bichiakoh pass, 3,000 ft. : Hettáunda 28167 :
(2) Ascent from Likhu valley to Sángli khola, 29941 : under Niakot, 29909.

Liliaceæ.

Smilax parvifolia Wall.
(2) South of Támbeh Khání : above Chitlong :
(3) West of Pherphing : Kakni hill top, 9th December 1907.

Smilax prolifera Roxb.
(1) Parsua in Jungle.

Asparagus racemosus Roxb.
(1) Simalbása to Bichiakoh, very common especially in the sál forest, 29458 : north face of Chorea Gháti :
(3) Forest above Chitlong 29692.

Tupistra aurantiaca Wall.
(3) Kakni, common on the hill top, 6,800 ft., 29886.

Pontederiaceæ.

Monochoria hastæfolia Presl.
(1) Tájpur north of Birganj, 29371.

Commelynaceæ.

Commelyna sp.
(1) Top of Bichiakoh pass.

Palmeæ.

Phœnix sylvestris Roxb.
(1) One tree under Niakot.

Phœnix humilis Royle.
(1) Parsua, rare in jungle: south of Hettáunda; foot of hill under Niakot, called "Thákar," not uncommon on the red soil, 29905.

Pandanaceæ.

Pandanus furcatus Roxb, var. **indica** Kurz.
(1) Bháinsa Duhán, 14th December 1907:
(2) Thánsing towards the Sángli khola.

Aroideæ.

Arisæma sp.
(3) Kakni, 6,000 ft.: Sángli khola.

Amorphophallus sp.
(1) Bháinsa Duhán.

Remusatia vivipara Schott.
(2) Near Khátmándu, 4,000 feet, 5th December 1907.

Colocasia Antiquorum Schott, var. **typica** Engler.
(1) Parsua, 29410: banks of the Trisuli below Niakot, 9th December 1907:
(2) Between Jáitpur and Kakni, 5,000 ft., 29875.

Raphidophora glauca Schott.
(1) Bháinsa Duhán.

Lasia heterophylla Schott.
(1) Parsua.

Lemnaceæ.

Lemna sp.
(2) Márkhu valley: Chitlong.

Alismaceæ.

Sagittaria sagittifolia Linn.
(1) Parsua, 29397.

Naiadaceæ.

Potamogeton oblongus Viv.

(2) Márkhu valley.

Potamogeton crispus Linn.

(2) Above Támbeh Kháni, 4,000 ft., 29640 : Pherphing, 29962.

Eriocaulaceæ.

Eriocaulon sp.

(2) Chitlong, abundant, 29693.

Cyperaceæ.

Kyllingia triceps Rottb.

(1) Parsua, abundant, 29412.

Kyllingia brevifolia Rottb.

(1) Between Parsua and Simalbása, 29422.

Cyperus flavidus Retz.

(1) Half way between Birganj and Parsua near Tájpur, 29366 : rice fields of the Tádi river.

Cyperus tuberosus Rottb.

(1) Banks of Trisuli below Niakot, very abundant, 29917.

Cyperus radiatus Vahl.

(1) Parsua, 29409*a*.

Cyperus auricomus Sieber.

(1) Parsua, very common, 29409*b*.

Cyperus pumilus Linn.

(1) Sands of Tádi river, under Niakot, 10th December 1907

Mariscus microcephalus Presl.

(1) Birganj to Parsua, 29364 : Parsua, common, 29395.

Fimbristylis dichotoma Vahl.

(1) Between Parsua and Simalbása, 29421.

Eriophorum comosum Wall.

(1) Above Bichiakoh, very plentiful :

(2) Márkhu valley, plentiful . near Bhimpedi in abundance.

Carex hymenolepis Nees.

(1) Bháinsa Duhán, 29573.

Carex filicina Nees.

(2) North descent from Chessapáni pass, 4,500 ft., not uncommon, 29626.

Gramineæ.

Panicum flavidum Retz.

(1) Simalbása, 29433.

Panicum colonum Linn.

(1) Terai, Birganj to Parsua.

Panicum prostratum Lamk.

(1) Simalbása to Bichiakoh, very common, 29434.

Panicum indicum Linn.

(1) By Kuro nadi near Hettáunda, 29533.

Panicum myosuroides R. Br.

(1) North of Birganj, 29365.

Thysanolæna acarifera Nees.

(1) Gorge north of Hettáunda, sparingly:

(2) Near Khátmándu, 11th December 1907: Chessapáni pass.

Oplismenus compositus Beauv.

(1) Parsua under trees: Simalbása to Bichiakoh, the commonest grass in the forest, 29431: Tádi valley, common.

Arundinella brasiliensis Raddi.

(1) Near the top of the Bichiakoh pass, very common, 29501.

Setaria glauca Beauv.

(1) Parsua to Bichiakoh, common, 29452: rice fields by the Tádi river.

Coix Lachryma-Jobi Linn.

(1) Top of Bichiakoh pass, 29998.

Pollinia articulata Trin.

(1) Simalbása to Bichiakoh, very common, 29438.

Pollinia argentea Trin.

(2) Above Márkhu, common, 29667.

Saccharum spontaneum Linn.

(1) Fields near the Tádi river.

Saccharum Narenga Ham.

(1) Parsua in jungle: Hettáunda.

Erianthus fulvus Nees.

(2) Márkhu, 4,000 ft., 29652.

Ischæmum angustifolium Hack.

(2) Above Thánsing, rare.

Pogonatherum polystachyuum Kunth.

(1) Bichiakoh in quantity: Supári tár: banks of the Trisuli under Niakot.

Andropogon assimilis Steud.

(1) Chorea Gháti: Bichiakoh to Hettáunda, 29484: Bháinsa Duhán, 29576:

(2) Under Niakot:

(3) Kakni, common, 9th December 1907.

Andropogon contortus Linn.

(2) Niakot, 29912.

Andropogon fascicularis Roxb.

(1) Simalbása to Bichiakoh, not uncommon, 29442.

Andropogon intermedius Willd.

(1) Between Parsua and Simalbása, 29416.

Andropogon acicularis Willd.

(1) Terai, Birganj to Parsua.

Andropogon melanocarpus Elliott.

(1) Adhabhár to Bichiakoh, 29454.

Andropogon ? distans Nees.

(1) Adhabhár to Bichiakoh, 29465.

Cymbopogon Martini Stapf.

(1) Parsua in jungle and northwards: under Niakot.

Anthistiria gigantea Cav.

(1) Hettáunda, 29545.

Anthistiria imberbis Retz., var. **Roylei** Hook. f.

(2) Márkhu, 4,000—4,500 ft., 29668.

Cynodon dactylon Pers.

(1) Terai, Birganj to Simalbása, and in forest northwards: Bichiakoh.

Chloris incompleta Roth.

(1) Simalbása to Bichiakoh, common, 29432.

Eleusine coracana Gærtn.

(2) Near Khátmándu, 5th December 1907: ascent from Thánsing to Sángli khola, 29951.

Phragmites Karka Trin.

(1) Simalbása at edge of forest: Hettáunda: gorge of Bháinsa Duhán, above Bhimpedi.

Eragrostis amabilis W. & A.

(1) Terai, Birganj to Parsua, rice fields along Tádi river: Simalbása to Bichiakoh, 29439.

Eragrostis stenophylla Hochst.

(1) Raxaul to Parsua, 29362:

(2) Márkhu, 4,000 ft., 29658.

Arundinaria sp.

(3) Forest above Chitlong.

Bambusa ?

(1) A bamboo is not uncommon in the gorge north of Hettáunda.

GYMNOSPERMÆ.

Coniferæ.

Pinus longifolia Roxb.

(1) Chorea Gháti, from Bichiakoh to the pass, and a very short way down on north face: rare, under Niakot.

Filicinæ.

Gleichenia dichotoma Wall.

(2) North descent from Chessapáni pass, 29624: over the Bágmati river on the road from Pátun to Pherphing:

(3) Fákhel, common.

Gleichenia longissima Blume.

(3) Near Kakni, 29877.

Alsophila sp.

(2) North side of Sángli khola.

Ceratopteris thalictroides Linn.

(1) Under the Sángli khola at Thánsing, 29931.

Cheilanthes farinosa Kaulf.

(1) Thánsing.

Adiantum caudatum Linn.

(1) By the Trisuli river, south of Niakot.

Adiantum Capillus-Veneris Linn.

(1) Under Niakot.

Pteris aquilina Linn.

(2) Bhimpedi to Siságarhi:

(3) Kakni.

Nephrolepis tuberosa Presl.

(1) Under the Sángli khola at Thánsing, 29933.

Polypodium coronans Wall.

(1) Thánsing, 11th December 1907: under Niakot:

(2) Bhimpedi to Sisagárhi, Fákhel.

Polypodium simplex Sw.
(2) Near Tâmbeh Khâni, 3,800 ft., 29632.

Polypodium sp.
(3) Near Kakni, 29874.

Ophioglossum vulgatum Linn.
(1) Trisuli banks, under Niakot, 29919.

Lycopodiaceæ.

Lycopodium cernuum Linn.
(1) Supári tár, very abundant.

Equisetaceæ.

Equisetum ? debile Roxb.
(2) Márkhu.

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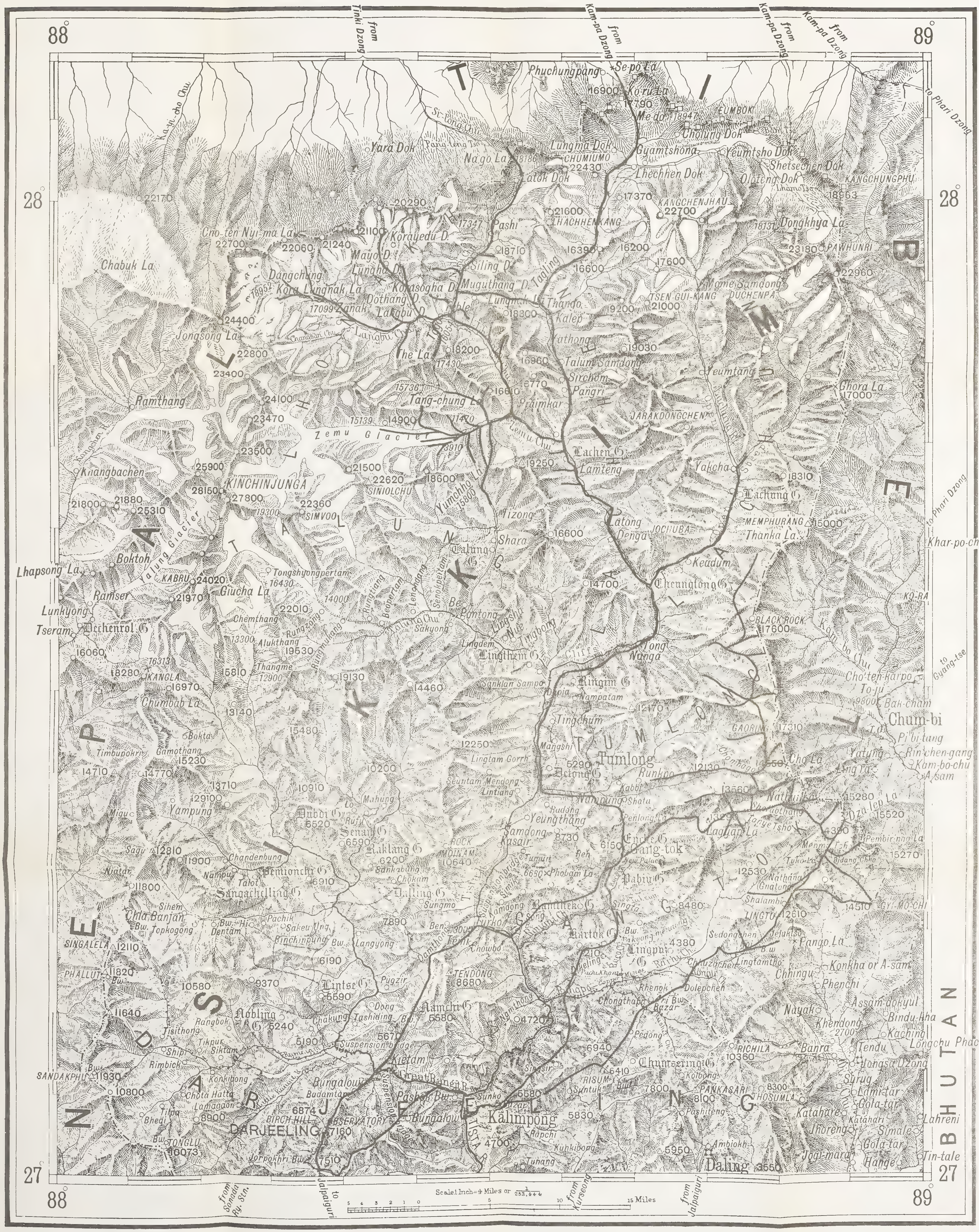
Map
OF
SIKKIM



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REFERENCE

G	Gom-pa or Monastery
La	Pass
D	Dok, or Cattle Station

Province or State Boundary	—··—··—
1909 Tour Shown thus	～～～
1910 Tour Shown thus	～～～

CORRIGENDA TO No. 5

Page 168, line 29, *for* trichophylus *read* trichophyllus.
„ 192 „ 11 „ distinctus „ distincta.
„ 192 „ 14 „ multi „ multa.
„ 194 „ 13 „ staminorum „ staminum.
„ 194 „ 20 „ caespitose „ caespitosa.
„ 194 „ 24 „ augustiora „ angustiora.
„ 277 „ 17 „ sed ad 5 mm. „ ad ·5 mm. sed
„ 278 „ 10 „ Beaumontia brevituba, MacGreger et Smith, *read* Beaumontia shanica, MacGregor et Smith. Nom. nov. The specific name *brevituba* is preoccupied.

Page 279, line 1, *for* "bracteatus" *read* "bracteata."
„ 279 „ 19 „ "graciliflorus" *read* "graciliflora."
„ 280 „ 2.

Stereospermum grandiflorum Cubitt & Smith.

This species was described from scanty material and owing to a mistake in the field the leaves of *S. suaveolens* were mixed with the inflorescences of the new species. More ample material is now available. The new species is closely related to *S. neuranthum* Kurz and is distinguished by more or less rounded glabrous leaflets and the glabrous inflorescences with somewhat larger flowers.

The following correction is necessary in the description :—

Folia imparipinnata, rhachide plus minusve 10 cm. longo, subglabro, foliolis 3—5, late ellipticis vel nonnunquam suborbicularibus, apice rotundatis, basi subrotundatis, subintegris, margine undulata, 5—20 mm. petiolulatis, glabris, 6—15 cm. longis, 4—9 cm. latis. *Capsula* plus minusve 30 cm. longa, 4 mm. lata, forma specieque ei *S. neuranthi* proxima.

Add to records :—Upper Burma, *Prazer* ! ; Bhamo, *Marsden* !

RECORDS

OF THE

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THE VEGETATION OF THE ZEMU AND LLONAKH VALLEYS OF SIKKIM.

By

W. W. Smith & G. H. Cave.

THE Sikkim Himalaya including in the term the Darjeeling District as well as independent Sikkim is fairly well known botanically. In addition to the historic explorations of Sir Joseph Hooker in 1848-49, botanists have traversed most of the ranges and valleys during the last 40 years and the Calcutta Herbarium possesses large collections made by the late Sir George King, the late C. B. Clarke, Lieutenant-Colonel D. Prain, J. S. Gamble, Sir George Watt, the late R. Pantling, G. A. Gammie, by Forest Officers and by the staff of the Government Cinchona Plantations and Lloyd Botanic Garden. In addition Lepcha collectors have been employed regularly for many years chiefly to obtain seeds of such species as are welcomed by botanical gardens throughout the world.

The result is that probably no corresponding area in India has been so fully ransacked for its flora and probably none is so well-known, despite the wealth and variety of its vegetation due to the great range of altitude and of humidity. There are, however, several of the more remote and difficult valleys which have never been explored either by botanists or native collectors in addition to some which have been only partially so.

The portion of this Sikkim Himalaya least known is the north-west corner comprising the valleys of the Zemu and Llonakh rivers with their tributaries. These valleys are the most distant from the main roads, the most difficult of access on account of rhododendron jungle or high passes and so inclement and inhospitable that for nine months of the year they are devoid of inhabitants. In neither of them is there a house of any kind beyond a shelter of inclined logs in the Zemu valley and the yak-hair tents of the nomad Tibetan herdsmen in Llonakh. There are no roads and no bridges and the traveller has to leave his ponies behind. Difficulties of commissariat for a large party are great in a district where there is nothing to be got from the inhabitants and a tour is consequently expensive. As the three or four months during which it is possible to visit these uplands are June to September, this means travelling from Darjeeling during the rains and the possibility of routes and communications being much interrupted. Added to the natural difficulties there has been until of late years a political difficulty. The Llonakh has long been claimed by the Tibetans who send many yaks and sheep there during the short summer. It affords comparatively good grazing—where the best is but poor—and is almost inaccessible for those animals from the Sikkim villages. Hooker in his Himalayan Journals records the numerous difficulties put in his way by the headmen of the various villages to prevent his going further north than Lachen. Not so much objection was offered to his proceeding up the Zemu and Llonakh valleys but he was unable to reach the upper portions of these owing to the impenetrable nature of the rhododendron forest through which his party was too limited in numbers to cut their way. More than 40 years later in 1892 a proposal to send an official botanist, Mr. G. A. Gammie, to the Zemu valley was frustrated by the difficulties the Government were at that time experiencing in their relations with the Tibetans and it was not deemed safe to permit of the tour. Since that date Llonakh has been visited by Mr. J. C. White, C.I.E., late Political Officer in Sikkim, in 1902 (previously in 1891); in part by Mr. Douglas Freshfield and a party of mountaineers in 1899 (*vide* "Round Kangchenjunga" by Douglas W. Freshfield), but no botanical collections have ever been obtained from this area with the exception of a few plants which were collected by Colonel now Frank Younghusband of the Tibet Frontier Commission in 1903, from the neighbourhood of the Naku La, and which are now in the Calcutta Herbarium.

With a view to studying the flora of this area and of bringing back as complete a representation of the vegetation as possible, it was the good fortune of the present writers to be deputed there for the months of July-August 1909.

Preliminary arrangements involved considerable time and labour. We shall refer here only to such points as may be of service to any one proposing to travel in that area.

The tent ought to be carefully chosen for lightness and size. Except on the flat areas by the Llonakh river, it is almost impossible to find a level piece of ground on which to pitch a tent of any size. Especially in the lower Llonakh valley and the upper Zemu, is it difficult to get a camping ground. In many places no path whatever, so that the heavy tent which requires several men to carry is here simply a source of trouble. C. had been frequently on the Singalela and other spurs before and his conclusion is that light Willesden canvas sleeping-tents are the most satisfactory, total weight each 20 lbs., triangular with only one aperture, the floor being continuous with the sides. Canvas sheets fifteen feet square of the same material give the hardy Lepcha collectors a shelter which they much appreciate as they are readily transformed into tents with the aid of some poles from the forest.

As for carriers they must be hired in Darjeeling. Local men can be got stage by stage to take goods to Cheungtong, but up to Lachen and Thango the supply is uncertain and in Zemu and Llonakh itself there are no inhabitants to hire. In upper Sikkim the inhabitants are few and often 'not at home' being chiefly herdsmen, and the traveller who relies on local supply of coolies may experience exasperating delay. When we wished an extra man or so, we sometimes were unable to obtain him not from any unwillingness on the part of the people but simply because coolies were not available. Our own party numbered 20 coolies eight Lepcha collectors and boys and three personal servants and the 20 coolies represent about a minimum. Not only had most of our own supplies to be carried but we had to feed the men also. The country produces little or nothing for the stranger as there is little trade and the inhabitants grow only what they require. Up to Gangtok the coolie train can obtain provisions—beyond that one must provide for them. The traveller himself may obtain an occasional fowl of uncertain age and certain toughness and sometimes eggs. At Lachen in July-August very excellent potatoes may be purchased and a few beans and turnips. In the Zemu valley—nothing. It may happen that a flock of sheep be grazing there—probably not more than one flock—and sheep, milk, and butter, thus be available. Partridges and pigeons are not scarce. In the Llonakh during the short summer many herds of yak and sheep come across the border and the Tibetan attendants are very obliging and willing to trade. Barter is not necessary—they have learnt to recognise a rupee. A good sheep may be had here for R4; wild geese, ducks, pigeons are not uncommon. Wild sheep—*Ovis nahura*—are seen occasionally, but they are not to be reckoned upon as a probable source of supply.

Our staff of coolies was quite inadequate to carry all the impedimenta including collecting materials; so we had the bulk of the stores taken by mules to Lachen as a base and the men went backwards and forwards between Lachen and our shifting camps.

The period of the proposed tour being in the height of the rainy season we anticipated unpleasant experiences until we arrived at the upper valleys where the rainfall is comparatively light. Our fortune, however, was of the best, and from the 30th June to the 28th August we had only one really wet day. There is no guarantee that this is the usual condition of affairs—it is generally very much otherwise. Something is to be said for the plan of starting on a fair morning and travelling up the Tista with the fine weather—sometimes one can thus keep ahead of the next monsoon storm from the south.

The bulk of the baggage having left on June 27th with the majority of the coolies, we started from Darjeeling on the morning of the 30th June. Our objective being the flora of the north-west corner, we made no stop or deviation from the road for botanical purposes until we reached our base Lachen. What we met with by the wayside we secured, if it seemed worth while recording. More ways than one lead to Gangtok and we chose the short and hilly route by Namchi and Song, thus avoiding the Tista valley road which is very unhealthy at this season; the people above Lachen call it the "Valley of Death" which is expressive enough.

We passed Lebong and Badamtam reaching the Manjithan bridge where the frontier was crossed about noon. Then a long climb on the ponies up to Namchi bungalow. The following morning was very wet. We reached Temi at noon, and the weather improving, pushed on to Song which is further away than the mileage given for it. We arrived after dark. This is too long a stage for coolies at this season. Most of ours appeared next morning. We may be prejudiced but the Sikkim mile is hereabouts not a constant.

The forest above Song is very fine and is a good district for orchids. Signs of increasing cultivation are everywhere—soon many districts will be entirely destitute of the dense forests of Hooker's days. It is to the advent of the Nepali cultivator that most of this change is due. We arrived at Gangtok on July the 2nd and found to our annoyance that the advance baggage had got stuck here instead of proceeding on to Lachen. The sirdar in charge had got into difficulties with local mule contractors who were evidently driving a hard bargain with him.

The 3rd July was spent in Gangtok. We here wish to record our indebtedness to Mr. C. H. Bell, I.C.S., the Political Officer of Sikkim, for the facilities afforded us and for the kindness with which he secured for us a favourable reception by the headmen of the villages up the river. Throughout our relations with the people were of the pleasantest and no difficulties were experienced as far as they were concerned. Here also we sent our ponies back and until we arrived again in Gangtok on August 24th our journey was done on foot with the exception of our three days' visit to the Kangralamo La. Our routes up the Zemu and up the Llonakh were out of the question for ponies, even Sikkim ones.

On July 4th we left Gangtok and took the next stage to Dikchu bungalow. Our route led over the Penlong La (6,250 feet), and then followed a long precipitous descent to Dikchu. Here the first day's rations were given out to the coolies, each man receiving one seer of rice, quarter seer of dal with small additions of ghee, salt, etc.

On the 5th we left Dikchu and proceeded up the valley. The elevation of Dikchu is about 1,500 feet and on the way to our next halting place Sinchik we gradually rose to about 4,000 feet. The road follows the stream for the first four or five miles and then makes a fairly easy ascent. It proved a hot and tiring day, especially at the lower levels. Here and there in the valley bottom were small plantations of *Ficus elastica* introduced by the Sikkim Government. The vegetation was that of the Darjeeling District at a corresponding altitude. *Gesneraceæ* were common along this route decking the cliffs and boulders. Green pigeons were numerous feeding on the fruits of *Macaranga denticulata.* We arrived in the afternoon at Sinchik where the bungalow faces a fine hill clothed with forest with the river between and far below.

On the following morning we marched by way of Tong to Cheungtong at the junction of the Lachen and Lachung rivers. A pleasant winding path to Tong and then a sharp dip to a bridge crossing the Tista. Among the noteworthy plants seen here were *Leptocodon gracilis,* a beautiful but evil-smelling flower, *Didissandra lanuginosa, Tylophora tenerrima, Baliospermum corymbiferum, Woodwardia radicans.* Five miles from the bridge brought us to Cheungtong where there is a new bungalow for the traveller on the flat near the rivers instead of the upper storey of the monastery as in former years. On the 7th we left early following the Lachen branch of the Tista. The tropical and semi-tropical flora of the lower Tista now gives place to a flora characteristic of temperate regions—a transition fully described by Hooker in his Himalayan Journals. Here *Chirita Clarkei* was met with, a rare Gesnerad, and *Decaisnea insignis,* not a common plant in Sikkim—it is seldom sent in by the native seed-collectors though possibly this latter fact is due to its being edible. The same fate befalls the fruits of the larger *Rubi*, the Lepcha considering it a waste to put such things into drying paper.

So far we had seen little of the leech, that pest of Sikkim jungles. This good fortune followed us throughout the tour, as neither of us, and scarcely any of the coolies, got a single bite. The road between Cheungtong and Lachen is very up-and-down and it was late before we reached Lachen—eight days from Darjeeling for our laden men.

We made our base at Lachen. The next day was spent in overhauling and arranging our stores. These had arrived intact in spite of the shaking given them by the mules over the rough paths. As we anticipated uncertain weather and little shelter in the upper valleys we arranged that one of our Lepcha plant collectors should remain at head-quarters with a lad and attend to the thorough drying of the plants we sent down. It would have been impossible under the conditions which prevail at this season in the Zemu and Llonakh to get our collections properly looked after in camp. The danger from damp would have been too great. Through this precaution we were able to preserve all our collections with little or no damage.

Signs of more ambitious cultivation are evident in Lachen. Fairly well-tended gardens are to be seen in the vicinity of the rough houses. The potatoes to be obtained here are of excellent quality. A flourishing weaving school has been established by the Swedish Mission and turns out rugs, blankets, etc., made from Tibetan wool, dyed with materials extracted from forest plants. At the time of our arrival most of the inhabitants had gone to the high hill pastures in the upper valleys with the flocks and herds. The Phipon or headman came to pay his respects and we arranged with him for a guide who joined us next morning.

On the 9th we left with our camp equipment and enough food for a few days. A march of between two or three miles brought us to Zemu Samdong, *i.e.*, the bridge over the Zemu. We found the latter almost as large and quite as rough a cataract as the Lachen. Here we bade farewell to the road and turned into the Zemu valley proper. The track was of the roughest and impossible for ponies. Our camping ground being uncertain, we had to keep with our coolies and see that they did not linger too far behind. Only once on the expedition did we have to pass the night without our blankets and without any food—and that was a sufficient lesson.

The forest was at first mixed. Gradually the rhododendrons prevailed until ultimately we were almost entirely enclosed by them. In the afternoon we came on the junction of the Llonakh and Zemu—both foaming cataracts. We crossed the former by a rough bridge and after another half hour's struggle with *Rhododendron Hodgsoni* reached an open tract tenanted by a 'gôt' or flock of sheep and affording a good camping ground at somewhat over 10,000 feet. The attendant shepherds were clad only in a rough coat and a blanket, seemingly most inadequate protection against the rough weather of the Zemu. Tents were pitched in a cold drizzle—no very pleasant welcome to the valley. This proved a very stiff day especially to the laden men on account of the depth of mud among the rhododendron roots—a purgatory of a road which we were to see later on at its worst.

We left our first camp next morning in a drizzle to proceed further up the valley and establish a fixed camp for a week or 10 days. What track there was led through a dense growth of rhododendron, chiefly *R. Hodgsoni*, our enemy of the day before. Here and there were clumps of small bamboos which were dripping wet and added to the discomfort of the thick heavy mud under foot. Occasional logs and branches, wet and slippery, had been placed by the shepherds to improve the track in the worst places. In the undergrowth *Paracarya glochidiatum* was common and in beautiful flower—also *Smilacina oleracea* and species of *Arisaema*. The latter were in demand as an article of food not only by the people of the district but by bears of whose digging operations there were plenty of signs. Our guide presented us with some of the cakes made of these aroids but we did not venture on more than a taste. A few we kept as curios ultimately resembled thick slabs of glue and probably would prove as dangerous to unaccustomed stomachs.

The track continued bad to 11,000 feet but subsequently after crossing the Tumrachen Chu by a rough and very precarious bridge of logs the valley opened out—trees became fewer and the rhododendrons less troublesome. Towards the close of the day we reached a rough shelter of logs at an elevation of just under 12,000 feet. This is the only erection approaching a permanent structure in either the Zemu or the Llonakh valleys and must be but rarely tenanted. It cannot be called a hut—two sets of heavy logs are set against one another, one end is filled with brushwood and the 'house' is complete. Small as were our tents it was difficult to find a level spot of sufficient size for a camp, and the first night our slumbers were disturbed by a tendency to slide down the incline. However we had a lullaby as Hooker had—the continued rumbling of the boulders in the boisterous Zemu resembling thunder in the distance.

The hut rough as it was proved a useful shelter for our men and a convenient place to put some of our stores; so this spot became our head camp for the next fortnight. It was well sheltered with wood and water in plenty. At this height in the valley there are very few large trees and these only in secluded places by the stream. The hill-side is covered with boulders which are usually hidden by a rank growth of small trees and shrubs—sometimes by a wealth of herbaceous plants. In sandy places by the stream *Tamarix, Epilobium reticulatum, Cardamine macrophylla,* species of *Pedicularis, Parochetus communis,* and *Primula sikkimensis* were all common.

On the 11th C. went to the Yumchho La while S. ascended the hill on the north side of the camp to a height of over 14,000 feet. On the way up *Meconopsis nepalensis* was very common and always a conspicuous object. Occasionally the blue *Meconopsis simplicifolia* was seen, but not frequently. The slopes were covered with a dense growth of shrubs and herbs from 1—6 feet high but the number of species was much smaller than we had anticipated.

C. went to the Yumchho La by a track which had been recently cut by the herdsmen through the rhododendrons of just sufficient width to permit of the passage of yaks. This route leads from Llonakh over the Thé La and follows the Tumrachen down to its junction with the Zemu which river is crossed by a rough cantilever bridge not far from the small Tumrachen bridge. The track ascends the ridges on the south side of the Zemu with a directness which is rather fatiguing. On the south side lies the huge mass of Lama Anden covered on the northern side with large glaciers even at 14,500 feet. The path enters a broad valley with cliffs on either side, and this leads to a shallow lake at 15,000 feet, at times no doubt dry. The pass itself is about 15,800 feet. The south side of it had been visited by C. in 1906 approaching from Be and Talung. The night was spent under a rock and the return journey made by the same route on the following day.

Meanwhile on that day S. proceeded two miles up the valley and then ascended the northern side to 15,700 feet. The day was fine and afforded a magnificent view of the whole line from Kangchenjunga to the precipices of Lama Anden—a line whose lowest gap is the Yumchho La and a most efficient screen against the heavier monsoon rains. The vegetation was abundant but not very varied. The impression of the previous day of the comparative dryness was confirmed by the character of the vegetation. The only moist region is that fed directly by the melting of the big glaciers at the head. The slopes up to 15,000 feet were not very productive. *Umbelliferæ, Compositæ, and Primulaceæ* were meagre in number of species though certain individual species were abundant. This paucity is not to be accounted for by our visit being early in the season. Rhododendrons were plentiful but not dense compared with what they are lower in the valley. *Primula sikkimensis* was abundant, *P. pusilla* less so. Above 15,500 feet the slopes became bare and rocky with here and there plants of *Rheum nobile* and *Cortia Hookeri.* The 13th July was another beautiful day and we began to think the Zemu a much maligned region. Leaving camp soon after 7 A.M. we found 2½ miles up the valley the only surviving snow-bridge on the Zemu and crossed to the other side where there is a capital path—for these regions. This is part of the old track from Thé La *viâ* the Thangchung La and the Zemu glacier to the Yumchho La. At present it is in fair order but the new track lower down already mentioned is safer and is almost certain to replace it. The chief objection to the old route is the uncertainty of the crossing over the lower end of the glacier—if the snow-bridges disappear early it is almost impossible to get across the rivers at the upper end of the valley.

The upper Zemu presents no great difficulties above 12,000 feet —the chief obstacles to the exploration of the valley being first the two days' march from Lachen through the trying rhododendron forests and secondly want of bridges in the upper portion of the river. Any bridge put up in the upper region would be without doubt carried away by the ice and snow of the long winter months. We could see no place where it was possible to ford the river—it is a headlong cataract right up to the spot where it issues from below the glacier. Although it narrows somewhat at its source the lack of timber at that elevation prevents the traveller improvising a temporary bridge. It would seem as if the valley is much more used by the shepherds than it could have been in Hooker's time and the occasional paths 'blazed' by these men render the place much less difficult of access. At the time of Hooker's visit to this valley there was much uncertainty regarding the nomenclature of the various streams, and in his Himalayan Journals the upper Zemu goes under the name of Llonakh, while the Llonakh proper was looked upon by Hooker as the upper portion of the Zemu.

Proceeding by the south side of the Zemu—that is the right bank—we found a track crossing several small streams which were easily forded in the morning, but when we were returning in the evening it was quite a difficult matter as the snow melting under a hot sun considerably increased the depth of the streams. There is no doubt about the daily periodicity of volume in the rivers here.

At about 13,000 feet we came to the base of the Zemu glacier. Here the Zemu stream divides into two, the northern branch known as the Poki Chu disappearing at once below the glacier and reappearing some miles further up, while the southern branch or Chumtha skirts the base of high cliffs. We managed to get across the Chumtha by another snow-bridge which even at this early time in the year was the only one available. We traversed most of the triangular area between these two streams but found only a very scanty flora. Continuing up the glacier we found some 'flats' kept cold and moist by the melting snow. Here the most conspicuous plants were *Primula capitata*, *Picrorhiza Kurrooa*, *Gentiana phyllocalyx*, prostrate *Salices*, *Diapensia*, *Diplarche*. Leaving the glacier we examined several of the ridges and slopes on the south side, ascending almost to the limit of vegetation. This limit, however, was reached much earlier than on the more eastern heights—no doubt the presence of the glaciers and the huge accumulations of snow tend to restrict vegetation to a very short period and to only a few hardy species.

The 14th we spent in the valley bottom in the vicinity of the snow-bridge. *Epilobium reticulatum* Clarke was in fine flower from 11,000 to 13,000 feet. Its height is from 3 to 12 inches and its favourite habitat is the sandy crevices between the loose boulders by the stream. It is very handsome, with very large flowers for the size of the plant. The 15th opened with a steady drizzling rain, but afterwards cleared. C. again ascended the main stream while S. followed a tributary up the hill to the north.

The smaller rivulet-beds usually gave an easy route up the hills and contained a number of small species among the stones—species which had no chance of survival in the dense shrubby vegetation on the slopes. The hills on this side do not much exceed 16,000 feet, and the amount of snow remaining in July is small and confined to a few hollows at the top. We found that most of these streams ran dry at about 500 to 1,000 feet above the Zemu, affording a strong contrast to those on the opposite side and at the head of the valley which are supplied by the huge Zemu glacier and the snowy slopes of a much higher range and with a northern exposure to delay the melting until the short flowering season. Among the rarer plants of the day's collection was *Primula elongata*.

Meanwhile C. had reached the Thangchung La about 17,000 feet. Evidently the route—Kambajong to Talung—over this pass was beginning to lose favour as there was no sign of a used track up from the Zemu glacier, though a few overgrown 'clearings' and the walls of deserted cattle 'corrals' were evidence that it had been a regular route not long before. The rhododendron scrub was here troublesome but on the pass there was no snow. The ridge was practically barren.

On the 16th with continued fine weather we ascended to the top of the hill behind the camp, taking all our collectors. This is about equal in height to the Thangchung La. The top was rocky and bare with no snow even at 17,000 feet, while opposite and 2,000 feet lower the slopes were covered.

On the 17th we crossed the snow-bridge again and ascended he old yak-track leading to the Yumchho La. The persistence of the snow-bridge up to the middle of July is further evidence of the absence of heavy rains in the upper valley at this time of the year. The tunnel of the bridge was very little larger than the usual daily volume of the stream and there could have been no flood during the previous two months. We found the southern slopes more thickly covered with rhododendrons. Snow lay at 15,000 feet and on the way to the pass we had to cross over fields of it sloping at an awkward angle. A false step would have meant a long slide of several hundred yards with ugly pinnacles of rock projecting here and there. One of two of the coolies showed a little hesitation at the unusual conditions—they would have preferred to tackle a precipitous cliff or swaying cane-bridge.

Crossing the Yumchho La we descended into the valley on the other side for about 1,000 feet. Here we met with the herdsmen and yaks of the Talung monastery. This valley is much wetter with large tracts of marshy land in which Primulas flourish. Here we found several species which do not appear to cross into the Zemu. *Primula Dickieana* and its variety *Pantlingii* were in special abundance, the whole sward being covered with them like an English meadow with cowslips. There seems no doubt that *P. Pantlingii* is only a form of *P. Dickieana*. Intermingled were whitish-yellow, yellow, mauve and purple forms and with umbels varying from one to six flowers.

Return the same day was out of the question, so we had to camp with our men under an over-hanging boulder with our blankets as our only protection.

On the following morning we made a survey of the vegetation of the Talung side of the pass including that of two shallow lakes which like most of these high altitude 'tarns" were practically barren. Recrossing the La and the snow-fields we descended to where the snow-bridge ought to have been. To our dismay almost the whole mass had disappeared down the Zemu and a racing current of icy water lay between us and our camp.

There was nothing for it but to trudge again some miles upstream to where, just below the glacier, by a curious accident two mighty boulders over 20 feet high had fallen from the hillsides and made a natural bridge with the pent-up Zemu foaming below. Scrambling up the wet and slippery face of the first boulder we made a hazardous descent by means of a notched pole to the flank of the other. These same boulders had proved of equal service to Freshfield's party some years before and are heavy enough to withstand the ice and snow of many years to come.

On the 19th C. crossed the glacier and ascended the Poki Chu for some miles. *Primula bellidifolia* was found near the head of the valley. The slopes around the glacier were particularly unproductive and further advance west up the glacier did not hold out much prospect to the botanist.

The next day was spent arranging the collections and getting ready for departure. On the 21st we descended to the junction of the Tumrachen Chu and on the following day, S. followed up that stream while C. explored the top of Nachegoh. The Tumrachen valley is narrow and precipitous up to 13,000 feet and the track keeps well away from the steep river banks. *Abies Webbiana* and *Juniperus* were common. Above that height the valley is open affording good pasturage almost up to the La.

Nachegoh took C. five hours' stiff climbing, mostly through rhododendron scrub. Large areas here and there had been cleared in previous years by the shepherds and these yielded herbaceous plants, mostly prevalent species. The top was sparingly snowed, and scored extensively by landslides and screes. Snow and sleet were falling—a foretaste of Llonakh where every month even in summer has its snowstorms.

Before ascending the Llonakh it was necessary to visit our base and secure what we had already obtained. On the 23rd we marched to the site of our first camp near the junction of the Zemu and Llonakh, deposited the tents, etc., and proceeded through the lower valley to Lachen. There was evidence that much rain had fallen while we had been in the comparatively dry upper valley The road was worse than ever. In some parts of the track the water was above our knees. The bungalow with its comfortable fire was a welcome change.

It may be expedient here to pass in brief review the vegetation of the Zemu valley.

The Zemu area may be divided botanically into three regions—a temperate forest region from 8—11,000 feet, a subalpine shrub region from 11—14,000 feet, and an alpine region from 14—17,000 feet. On entering the valley at Zemu Samdong, 8,000 feet, the slopes are steep and the bottom of the valley dark and thickly wooded. The forest is mixed. Along with the conifers—*Picea, Larix, Tsuga, Abies, Juniperus,* there occur numerous species belonging to the following genera:—*Berberis, Ilex, Euonymus, Acer, Rubus, Neillia, Rosa, Spiræa, Pyrus, Ribes, Pentapanax, Viburnum, Lonicera, Gaultheria, Rhododendron, Enkianthus, Litsæa, Daphniphyllum, Elæagnus, Corylus, Betula, Alnus.* Gradually as we ascend the *Rhododendrons* and *Coniferæ* tend to prevail and at 10—11,000 feet the forest is chiefly composed of them. At 11,000 feet the character of the valley begins to change. The tall *Rhododendrons* disappear, their place being taken by intermediate forms such as *R. Wightii* and *R. campanulatum,* which are quite as difficult a barrier. The *Coniferæ* too begin to thin off. The valley opens out, becomes lighter and is more sheltered from the monsoon rains. The main current of the monsoon rainstorms in this region seems to pass up the Lachen and not to affect the Zemu and Llonakh much above their junction. Herbaceous species become more prominent, especially at the open areas near the river which have been cleared by the herdsmen or by landslips.

From 11—14,000 feet, up to the base of the glacier, the small shrubs prevail—the large trees persist only in sheltered corners, generally near the stream. At 12,000 feet most have disappeared. The floor of the upper valley is filled with a chaos of boulders covered with straggling *Berberis, Pyrus, Cotoneaster, Ribes, Lonicera, Rhododendron, Salix,* from two to ten feet high. *Meconopsis, Cardamine, Corydalis, Lychnis, Astragalus, Potentilla, Sedum, Epilobium, Heracleum, Angelica, Saussurea, Primula, Pedicularis, Salvia, Polygonum, Rheum, Polygonatum* form the bulk of the herbaceous flora. From 14,000—18,000 feet—about the limit of vegetation—the prevailing genera are *Anemone, Corydalis, Draba, Potentilla, Saxifraga, Sedum, Cortia, Nardostachys, Cremanthodium, Saussurea, Leontopodium, Anaphalis, Rhododendron, Cassiope, Diplarche, Diapensia, Primula, Androsace, Gentiana, Swertia, Picrorhiza, Lagotis, Pedicularis, Polygonum, Rheum, Salix, Juncus, Carex, Poa.*

The lower valley is a wet forest, the upper valley, protected by the giant ridge from Lama Anden to Kangchenjunga, is comparatively dry.

In this upper region three distinct divisions may be noted:

I. The slopes from Nachegoh to the Thangchung La are open, free from snow at an early date, with tiny rivulets which soon become dry in the summer. The north side of the valley is remarkable for the persistence, up to nearly 17,000 feet, of species usually considered as belonging to lower altitudes. The typical 13,000 feet flora sends up representatives to nearly the top of the ridge and the plants characteristic of extreme alpine Sikkim are slow to appear.

II. The southern slopes, lying under the brow of the mighty range are sheltered from the sun and retain here and there the snow even in July down to 14—15,000 feet. Rhododendrons here tend to assert themselves to the exclusion of other genera and the slopes lack the variety of the north side, though alpines are more prevalent and appear at a much lower altitude.

III. The bleak area at the top of the valley where owing to the proximity of the glacier, the limit of vegetation appears to be reached sooner. The flora of this area approaches that of the second but is scantier.

Taken as a whole the valley is undoubtedly a transition from the moist prolific area such as prevails to the south and is typified by Jongri, to the dry area of Tibetan Sikkim lying beyond the Thé La. Though much poorer in species than the Jongri area it has on the whole more affinities with it than with the Llonakh. The lack of epiphytic forms, the comparatively scarcity of ferns, mosses, lichens, show an approximation, however, to what we found in the dry areas of Llonakh.

The Zemu valley forms undoubtedly the dividing line between these two types of vegetation; its flora is that of an attenuated Jongri while the Llonakh flora though less rich in species has a ‘facies’ of its own.

The valley is a very short one and gives no opportunity for a particularly varied flora. The above generalisations are, we think, as complete as the subject demands.

After one day at Lachen and one to reach the junction of the Zemu and Llonakh, we commenced the ascent of the latter. There were sheep-tracks for the first mile and then undisturbed rhododendron jungle. We kept at first to the right bank; the left is closed at 11,000 feet by a huge precipice. With much labour we reached 12,700 feet where the right bank becomes locked in by precipices. We collected materials for a bridge and camped among the rhododendron scrub. Next morning a precarious bridge of short logs tied with cord was made with much difficulty across the stream to a huge projecting boulder and up this we all scrambled, the baggage being divided into small packages and slung across by a rope. A long struggle with rhododendron jungle followed, the path having to be hewn with the Ghurka 'kookrie'. It took us all day to gain 1,000 feet of altitude. The Tibetan guide assured us that no inhabitant ever took the route we were attempting and left us under no misapprehension as to the general opinion of our wisdom. We cannot recommend the route. To go however by the Thé La means too many stages from the Lachen base and we did not know enough of the Nangma La to risk that route. But if that pass is clear, the easiest route to Llonakh is to go first to Thango and then across to Teble by the above pass.

Fortunately the weather was fine or our passage through the rhododendrons would have upset our coolies altogether. We halted for the next two days, the men going back for stores while we explored the ridges of Rongsa. Saxifrages were abundant. The vegetation was little different from that of the Zemu at the same height. C. ascended to the top of the ridge—over 16,000 feet. The most interesting plants were *Delphinium glaciale*, *Myosotis Hookeri*, and *Veronica lanuginosa*.

Transit by this route was so difficult and dangerous that we sent the majority of the men back with instructions to try the Nangma La with their next load of supplies. A practicable road could be made up the valley but two or three bridges would be required. No good wood can be got at the places where a bridge is necessary. The improvised bridge by which we crossed to the left bank was a rickety structure of gnarled birch poles with a cord here and there. It was carried away two days later. Fortunately Lepchas and Nepalis are experts at crossing unsteady bridges even when loaded.

On the 30th we continued our march. At 13,800 feet the valley contracts and deep gorges and screes run down to the main stream. These screes were in places a blaze of colour from *Primula sikkimensis*, *Pedicularis*, *Potentilla*, *etc*. It was possible now to travel at a fair pace by the stream. Here and there cliffs projecting into the stream necessitate considerable detours. At one spot the baggage had to be subdivided and hauled by ropes up the cliff face while the men had the same help to scramble up by. At last towards evening we reached 14,500 feet and entered the Llonakh 'flats'. From the first it was evident that the climate and natural features were quite different from anything we had met with so far.

We spent the following two days exploring the flats and screes near the junction of the two streams, the Lungma Chu and the Naku Chu, whose union gives the Llonakh. Both streams are turbulent and icy cold but as they have not the violent downhill rush of the Llonakh they can be forded at several places in their course. Caution is necessary as at this time of the year the volume is considerable.

These flats form a wonderful expanse of gently undulating ground in the midst of the highest peaks in the Himalayas. They extend up both the affluents of the Llonakh, but those along the Lungma Chu are more extensive than those up the Naku Chu and vary in breadth from one to three miles. They are the level floor formed by the action of some huge glacier or rather set of converging glaciers that have long ago disappeared or are now represented by comparatively small glaciers at the heads of all the valleys. There is no area in Sikkim which is quite the parallel of the Llonakh area. Should climatic conditions ever permit of the disappearance of the huge Zemu glacier, a similar basin would no doubt be found to lead up to the base of Kangchenjunga.

Here and there on the flanks are huge moraines,—accumulations of mighty boulders,—with a very limited flora sheltering in the crevices. These moraines begin at 14,500 feet and extend up to the existing glaciers. Once inside the Llonakh area the traveller finds his road easy as there is only the fording of the icy streams to hinder his march. The lower hills skirting the flats are rounded and smoothed as by a plane; covered with snow for nearly nine months of the year and with a short dry summer they have not lost the outlines given them by the action of the ice-field of previous ages. Above these hills the higher peaks have the craggy outlines and jagged rocks of the typical East Himalaya. The flats themselves are not continuous. Here and there the valleys contract to defiles and these lead to other flats at higher levels. At some intermediate epoch these flats were glacial lakes and in places the depth of alluvium is considerable. The streams of to-day are scoring deep channels in this alluvium. This is specially noticeable at the junction of the two streams where the river lies quite twenty feet below the level of the surrounding plain. High up in the side valleys the same formation is being worked out on a much reduced scale. Small lakes in shallow basins are found regularly a short way below the foot of each glacier.

The flats show evidence of strong persistent winds. The vegetation is almost entirely of the tussock type. The junipers and rhododendrons form mound-like projections on the plain, and their branches are gnarled and prostrate. Neither shrub nor herb raises itself more than a few inches above the general level of the plain. Only in the shelter of some huge boulder or by the cliffs do we find a plant one foot high. Our camp for the first two days was pitched in the centre of this open area but the night winds with occasional snow soon persuaded us to seek a more sheltered position near Teble where wood and water were more convenient and where the yak-herds could supply us with fresh milk and butter. The dwarf juniper provides excellent fuel and is fairly plentiful. It does not seem to be much used by the yak-herdsmen who prefer the dried yak-dung.

During our stay of nearly a fortnight in this valley the weather continued wonderfully regular. The morning broke clear with a north wind which prevailed until the afternoon. Then about 2 or 3 P.M. the south wind began to steal up the Llonakh gorge, bringing clouds from the valley below. With this wind came sometimes a gentle shower, sometimes mist and sleet. But the total rainfall is slight and we had reason to congratulate ourselves on finding one place in the East Himalayas where one may escape the full fury of the monsoon rains. The nights were piercingly cold with generally hoar-frost and occasionally a light fall of snow. The dawn brought gloriously clear views of the mighty ranges to the west and north.

Tibetan and Sikkimese herdsmen with sheep and yaks are scattered throughout the area and the total must be near one thousand yaks and twice as many sheep, the majority of which come from the vicinity of Khambajong over the Naku La. The pasturage seems sparse and poor from lack of grasses but it is evidently much valued. The yaks and sheep are in good condition and those of the latter which we tested had an excellent flavour.

Shifting camp on the 2nd August, we explored the lower end of the Naku Chu valley and the ridges to the east. Two or three miles up the stream we came upon a succession of swamps, more or less divided by lateral moraines. Over these swamps yaks were grazing while on the scattered lakelets were numerous wild geese and ducks some of which provided for us a pleasant change from tinned provisions. At the north end of the swamp is a square erection of rough stones possibly a blockhouse but called by our Tibetan guide and by a Khambajong family encamped near it the "Gumpa" and said to have been erected to mark off the La hen grazing ground to the south from the Tibetan to the north. This cannot be the rule now as we found Khambajong herdsmen at the extreme western part of Llonakh.

On the 3rd S. devoted his time to the marsh land which is of a type not seen elsewhere in Sikkim and contained *Hippuris*, *Glaux*, and other plants not previously recorded from this side of the Himalaya. Meanwhile C. as the better mountaineer left early to ascend the Naku La. Neither of us and few of the coolies suffered much at any time from the altitude. C. was sick once or twice on the tour when 16,000 feet was first reached, while S. did not experience more than a tightness round the head. Above 16,000 feet the chief disability was scantness of breath and the loaded men could only make a few yards at a time.

The marshes are not productive of many species and the few available are mostly of West Himalayan and Tibetan type—*Ranunculus aquatilis* in the pools, *Dilophia salsa*, a plant of the Tibetan salt marshes, *Primula tibetica* in profusion and fine clumps of yellow *Pedicularis*. Grasses and carices were disappointingly few and scarcely in flower. The slopes immediately above the river have a very piebald appearance—the dark tufts of juniper and rhododendron occupy in patches about one-sixth of the area, while large moraines and scattered boulders cover the rest. Among these stones a few hardy xerophytes are to be obtained but much of the area is quite barren. The juniper mounds shelter one or two species which do not dare to face the conditions unprotected. *Callianthemum* we found invariably thus.

Meanwhile C. had a long and arduous march to the Naku La. This is over 18,000 feet and is practicable for ponies and yaks. It is the easiest means of access to Llonakh—permissible, however, only to Tibetans. The river valley is a succession of flats interrupted by moraines and defiles. Most of the side streams enter on the left bank, only one of any size from the right which is much shut in with steep stony hills. The main stream comes from the south-west side of the Chumiumo glacier. The vegetation corresponds closely with that of the lower reaches except near the top of the pass where several interesting plants of Tibetan type were secured.

The 4th was a drizzling day with occasional showers of sleet. Fording the icy Naku Chu opposite Teble, three to four feet deep, we traversed the long line of hills and moraines which lead to the Ghoraphu valley. Next day we entered the Lungma Chu (Langbu Chu) valley, followed it up for four miles where we divided forces, C. crossing the stream and ascending the Thé La while S. continued directly up the valley. Here the broad outlet of the Ghoraphu Chu cuts across the main valley; this side valley might easily be mistaken for the main one as the latter is here narrowed and passes through a rocky defile up to which several parallel moraines lead. At its junction with the main stream the Ghoraphu is waist-deep but on ascending the side valley for half a mile the stream opens out into stony flats and may be easily forded. The Lungma Chu valley as far as Zanak was found to be of similar type to the Naku Chu—a succession of flats interrupted by occassional defiles and moraines. There is one very extensive lake-basin half way along its course where the depth of alluvium is considerable and where the river is cutting a deep channel. There is an interesting flora on these areas though it is sparse.

The other party had considerable difficulty in fording the Lungma Chu which was rapid and waist-deep. With joined hands C. and three men got through but the remaining three of the party with the clothes of the first batch preferred to go a mile up stream before risking it. These frequent crossings of glacier-fed streams were not altogether unpleasant in the sunny mornings but in the evening-mist or sleet only the sight of a roaring camp-fire reconciled one to it. The flora of the Thé La recalled that of the Thangchung La with its characteristic woolly *Saussureæ* and *Tanacetum.*

Next day S. ascended the valley of the Ghoraphu Chu to Korayedu—a long march presenting no difficulties beyond the fording of streams. It is chiefly in the intermediate valleys such as the lower Zemu that the most toilsome travelling has to be done. Above 14,000 feet the rhododendron scrub is much attenuated and in these higher Llonakh pastures almost absent. The valley continues for two or three miles a broad flat waste of stones with the stream broken up into numerous branches and in many places meandering unseen below huge accumulations of boulders. At 14,800 feet the stream divides, the larger branch taking a north-west course. The vegetation is that of the main Llonakh but sparser and more stunted. At 15,500 feet on the main branch we find the usual succession of marshes ending finally in a lake with a ring of cliffs and glaciers at the head of the valley with no apparent pass.

Meanwhile C. went due west up the main valley to where the smaller streams run down from the Jongsong La and the Choten-Nyima La. The herdsmen know of no regularly-used pass at this corner and they all come by the Naku La. On the higher hills here, once away from the vicinity of the yak-herds, flocks of *Ovis nahura* are occasionally seen. In the sandy tracks by the stream colonies of the Tibetan Marmot are fairly common.

We were not quite satisfied that we had got all that was to be obtained from the higher cliffs. Supplies, however, were short and the Nangma La (Lungnak La) trying to laden coolies. It was agreed that C. should take the five fittest men and the available provisions, camp as far up the west valley as possible, and give two or three days to the higher cliffs and screes while S. made two forced marches down to Lachen with the remaining men and one day's rations.. On the 8th August therefore S. crossed the Nangma La, 17,590 feet, a very stony pass but not difficult in good weather, though not practicable for ponies. A change is seen in the vegetation on crossing the ridge. The valley leading down to Thango and the Lachen is narrow, sheltered, and moist with no trace of the stunted Llonakh vegetation.

C. was successful in traversing the upper valley to nearly 18,000 feet—to the limit of vegetation. Heavy falls of snow covered his temporary camp and made collecting difficult. A fairly complete collection of the limited flora was, however, secured. Ascending the main valley on the 8th he pitched his camp on the river terrace at the highest level for juniper. In the afternoon the screes around the glacier to the north were explored but sleet and snow prevented much botanizing. Flocks of wild sheep and herds of wild goats were not uncommon and in such weather are easily approached. The herdsmen at the highest Dok reported that yaks carrying rice from Khangbachen (Nepal) in exchange for salt had arrived *viâ* the Jongsong La, the first arrival of the season and probably the last. In the morning the camp was covered with snow. The lower stream and flats were traversed and by 1 P.M. the permanent snow was reached. Avalanches were frequent. Alternate sleet and snow drove the party back to camp. On the following day in rather better weather the Jongsong La side was visited and explored up to the limit of vegetation. The slopes here are scarcely free from snow for sufficient time to give an opportunity to even the hardiest plants. Several inches of snow fell on the 11th and it was evident that nothing more could be done. A return was made by two long marches to Thango.

The upper part of the Lungma Chu is scarcely so rapid as the Naku Chu. The lake basins in its course are not swampy to the extent which prevails in the Naku valley. Tracts of alluvium in the higher regions seemed promising ground to explore but the results were disappointing. Few species survive to 16,500 feet and the ground above 17,000 feet is rarely clear of snow. It seemed to be a region where meteorological conditions hovered perpetually in the balance. The south wind prevailing for a short time would melt the thinner areas of snow and failing would give place to the north wind and a further sheet of snow. The soil does not appear unpromising,—there are many feet of alluvium in places—but the climatic conditions are too adverse. The proximity of the large glaciers is another factor just as at the head of the Zemu valley.

Thus far we have given at some length an account of the various days' marches. So little information is available in books regarding possible routes in the Zemu and Llonakh that we trust what we have given may be of some use to any one proposing to travel there. Our subsequent tour in the upper Lachen valley, a region which is fairly well known, does not require much detailed account. We wished to include this part of the valley chiefly for comparison with the Zemu and Llonakh. Meeting at Thango on the 12th we spent three days in going and returning to Kangralamo La (Koru La). Botanizing at the top was much hindered by driving showers of sleet and snow. Many interesting plants were secured in the neighbourhood of Giagong and on the hills round Thango. Lachen was reached on the 16th. Our arrangements permitted of a two days' visit to the Lachung valley. The usual stages brought us back to Darjeeling territory by the 26th August.

General aspect of the Llonakh Flora.

The physical features of the area have already been noted. Its vegetation may be divided into three groups, though these overlap considerably. I. The plants of the open flats and marshes. II. The plants of the moraines and screes. III. The extreme alpines of the upper cliffs.

The flora of the flats is the least sparse. Trees and shrubs have almost disappeared. Dwarf junipers, rounded and gnarled, are common; *Rhododendron lepidotum* and *R. Anthopogon* sparingly; *Berberis, Spiræa, Potentilla fruticosa, Lonicera, Hippophæ, Salix,* occasional, dwarf and prostrate. Among the herbaceous species the *Arenarias* are the most striking with their hemispheric mounds decked with beautiful white flowers. *Ranunculus, Caltha, Poterium filiforme, Saxifraga pallida, Primula sikkimensis, P. tibetica, Pedicularis* flourished in the moister areas. On the drier flats were *Delphinium, Hypecoum, Lepidium, Arabis glandulosa, Viola kuna-*

warensis, Stellaria decumbens, Stracheya, Guldenstædtia, Astragalus, Oxytropis, Saxifraga flagellaris, and its allies, white crusts of *Antennaria muscoides, Anaphalis xylorhiza,* many species of *Saussurea* and *Artemisia, Campanula, Cyananthus, Androsace Selago, Lancea tibetica,* the tiny sweet-smelling form of *Elsholtzia eriostachya, Urtica* and *Microgynœceum* near the Yak-doks, *Allium.*

The plants of the screes, sheltered from the wind by huge boulders attained sometimes a foot in height but the scanty water supply precluded everything but a few types. In addition to the junipers and dwarf rhododendrons the most prominent were *Anemone, Callianthemum, Draba, Saxifraga, Sedum, Trigonotis, Onosma, Swertia multicaulis, Picrorhiza, Eriophyton, Polygonum tortuosum, Allium.*

On the higher cliffs the prevalent plants were *Meconopsis horridula, Draba, Braya. Thlaspi, Cochlearia, Potentilla microphylla,* and *P. fruticosa* with their varieties, *Saxifraga imbricata, S. ramulosa, S. saginoides, Cortia, Allardia,* woolly *Saussureœ, Primula muscoides, Androsace Selago, Myosotis Hookeri, Veronica lanuginosa, Polygonum nummularifolium, P. Hookeri, Rheum nobile, R. spiciforme.* As will be seen from the concluding lists the flora has a strong admixture of West Himalayan and Tibetan species. The Llonakh in climate and vegetation has much more affinity with Tibet than Sikkim. The flora of Thango and Kangralamo has very much the same western and northern 'facies' but the area is narrower, more sheltered and more humid than the open Llonakh flats. The following species of West Himalayan and Tibetan plants were found on the tour, and are we believe additions to the list of Sikkim plants:—

Thalictrum tsangense, Ranunculus aquatilis, Isopyrum microphyllum, Corydalis Hendersonii, C. Hookeri, C. mucronifera, Braya tibetica, Dilophia salsa, Capsella Thomsoni, Viola kunawarensis, Arenaria Littledalei, Arenaria densissima, Oxytropis tatarica, Oxytropis sulphurea, Spirœa ulicina, Coluria longifolia, Hippuris vulgaris, Callitriche verna, Lonicera rupicola, Lonicera spinosa, Saussurea Stella, Primula tibetica, Androsace Chamœjasme var. *coronata, Glaux maritima, Microula Benthami Pedicularis Oederi, Pedicularis rhinanthoides, Pedicularis alaschanica, Dracocephalum heterophyllum, Plantago tibetica, Polygonum tortuosum, Rheum spiciforme, Hippophœ rhamnoides, Urtica hyperborea, Urtica dioica, Stipa purpurea.*

A considerable number of new species were found including four interesting saxifrages. These new species are described in the list appended to this paper.

General Survey.

In the following brief review of the chief natural orders and genera, we are not taking into account the vegetation below 11,000 feet. The region below that height was hurriedly passed through and only a tithe of its flora appears in the list. On the other hand we believe that the record of the alpine flora to which we devoted most of our energies, is fairly complete for the area in question.

Rununculaceœ are only moderately represented. Form of *Anemone demissa* and the smaller alpine *Ranunculi* especially *Ranunculus pulchellus* are very common. Aconites are almost entirely absent from the grazing grounds of the Llonakh. *Delphinium cœruleum* is widespread but not abundant. Among the few shrubby plants of the higher regions are the smaller species of *Berberis* which persist far into the upper Llonakh valleys where they are much dwarfed and generally prostrate. *Meconopsis* is well represented in quantity by the three common species—the yellow *M. nepalensis* ranging the lowest, the blue *M. simplicifolia* next, while *M. horridula* occupies the rough stony screes in most inclement situations. The genus *Corydalis* is very prevalent and rich in species. The *Cruciferœ* are represented chiefly by *Drabœ* while *Cardamine macrophylla* is luxuriant in the moister valleys. Other genera are very sparingly present. *Lychnis*, *Stellaria*, and *Arenaria* are strongly represented in species and in numbers, the many forms of *Stellaria decumbens* being specially prevalent while the tufted *Arenarias* form one of the most characteristic features of the Llonakh.

Impatiens so prominent a genus in Sikkim persists only in the lower wooded portion of the Zemu while *Geranium collinum* reaches the upper Llonakh. *Leguminosœ* are only moderately frequent in the upper regions and are chiefly species of *Astragalus* and *Oxytropis*. *Potentillas* form one of the conspicuous features of the vegetation with many species and these very variable. *P. fruticosa*, *P. microphylla*, *P. peduncularis* *P. ambigua*, *P. eriocarpa* are the most prominent. With the exception of prostrate *Spirœas* and *Cotoneasters* other genera are almost absent except in the wooded lower valleys.

Saxifraga is another dominant genus. Almost all the Himalayan species of saxifrage are to be found in this fairly restricted area. Though never in profusion, they deck both the screes and the flats by the river, as well as the bleak crests of the passes.

Dwarf species of *Parnassia* are common while *Chrysosplenium* ascends to the inclement rocks beside the snow. The majority of the Himalayan species of *Sedum* appear in the area, some in profusion. *Umbelliferæ* are not so prominent a feature as in the Sandakphu—Phallut region. In the lower Zemu up to 13,000 feet the slopes yield *Bupleurum, Chærophyllum, Selinum, Archangelica, Heracleum,* but on the open wind-swept areas of Llonakh only the prostrate *Cortia, Pleurospermum Hookeri,* and lowly *Trachydiums* have much chance of survival.

Dwarf forms of *Lonicera* penetrate far into the bleaker valleys, becoming prostrate and spiny near the frontier. On the Zemu slopes *Lonicera hispida* is common, with several of its congeners. With the exception of *Galium* and that sparingly, *Rubiaceæ* are absent from the higher altitudes.

Compositæ are abundant and among them *Saussurea* is predominant. *Aster* and *Erigeron* are poorly represented, *Senecio* few as compared with the moister Jongri area, *Anaphalis* and *Artemisia* are common towards the dry Tibetan region, while *Cremanthodia* are conspicuous features of the screes. *Saussureas* are everywhere—the woolly forms are unfailingly present at the top of the rocky ridges.

Codonopsis and *Cyananthus* were well represented in numbers but not in species. *Rhododendrons* are as prominent as in other parts of Sikkim but limited as regards number of species. *Primulaceæ* are very abundant especially in the upper Zemu. *Primula sikkimensis, P. capitata, P. pusilla,* forms of *P. nivalis* are in profusion. *Gentiana phyllocalyx, G. amœna, G. tenella, G. crassicaulis,* and *Swertia multicaulis* are all widespread, and in places abundant.

Small forms of *Eritrichium* and *Trigonotis* are the chief representatives of the *Boragineæ* while the rounded cushions of *Myosotis Hookeri* are met with occasionally on the exposed ridges.

Pedicularis is another of the dominant genera of the region. The species occur in great profusion and with their bright colours are a conspicuous feature in the sparse Llonakh vegetation. Five or six genera of *Labiatæ* are not uncommon but on the whole the order is not well represented. Dwarf species of *Polygonum* and two stout *Rheums* are common. Prostrate species of *Salix* are prevalent right up to the melting snows, while in the lower valleys shrubs of six to twelve feet are scattered among the boulders.

Species of *Habenaria* and *Cypripedium* sparingly represent the *Orchideæ. Polygonatum, Smilacina, Allium, Lloydia, Clintonia* ascend far up the valleys. *Junci, Carices,* and *Gramineæ* are much less prominent than we anticipated, the higher ridges yielding but a poor harvest of *Monocotyledones.* Yaks and sheep may flourish on the grazing grounds of Llonakh but scarcely on the 'grass' of that area.

Ephedra and the dwarf *Junipers* ascend to over 15,000 feet, the limit of the latter being the limit of available wood for the camp-fire. Ferns are scarce in the Zemu as Hooker points out in his Journals. In the upper Llonakh they are rarer still, only three species being met with. The dominant genera of the area are *Arenaria, Potentilla, Saxifraga, Saussurea, Rhododendron, Primula, Pedicularis.*

The accompanying map is the most recent available. Our route is marked in red. Authorities differ regarding the altitude of some of the peaks and passes. Thus Freshfield gives 17,300 feet as the correct altitude of the Naku La, 16,752 feet for the Thé La. As our aneroid reads only to 15,000 feet, we have no valid data to quote. We tried to verify the names given to the various yak-stations in the survey map, but without success. The average Tibetan interrogated knew little beyond Naku La and Llonakh. At any rate these names are not current among the temporary inhabitants as far as we could discover. One or two of these 'doks' may be occupied summer after summer but there is nothing to show that the majority are definite 'stations', and likely to retain a permanent name. We mention this because the presence of these names on the map gives the impression that these places are as definite as for example the villages round Gangtok.

We are indebted for much kind assistance in the identification of our specimens. The types in the Calcutta Herbarium are not as complete as could be desired especially of the rarer alpines collected by Sir Joseph Hooker and of the plants of the Tibetan plateau. The authorities at Kew have kindly compared many of our plants with the original types and have favoured us with an opinion on most of the new plants submitted.*

M. Bonati has reported on the genus *Pedicularis*; M. Hamet is working up the *Crassulaceæ;* Mr. I. H. Burkill has taken the *Gentianaceæ*, while the late Mr. Robert Pantling examined the *Orchideæ.* We have to thank Major A. T. Gage, Director of the Botanical Survey, for his help and interest throughout.

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* The general account is the work of both authors; for any inaccuracies in the list and for the description of the new species I am responsible.—W. W. S.

DICOTYLEDONES.

I.—RANUNCULACEÆ.

1. Clematis Linn.

1. **Clematis montana** Ham.

Zemu Valley and Thango, 10-13,000 ft., No. 1193.

2. **Clematis zemuensis** W. W. Smith sp. nov.

Species *C. puberulæ* H.f. & T. affinis sed foliis bipinnatis vel biternatis, floribus stricte umbellatis et prælonge pedicellatis, filamentis latis perbrevibus distinguitur.

Frutex sarmentosus gracilis pubescens. *Folia* 10-12 cm. longa, 6-8 c.m. lata, bipinnata vel biternata, segmentis 2-3·5 c.m. × 1-1·5 cm. ovatis vel ovato-lanceolatis, acute lobatis vel serratis, subapiculatis, pubescentia vel subglabra; petiolus ad 3 cm. *Inflorescentia* axillaris; pedunculus prælongus ad 10 cm. pubescens; supra in 2-7 pedicellos stricte et umbellate divisus; pedicelli ad 7 cm. longi duabus linearibus bracteis (·5 cm.). *Sepala* 1·5 cm. × ·5 cm., patentia, oblongo-lanceolata, extra molliter pubescentia, 5-nervia, luteo-albi. *Stamina* 5-7 mm. glabra; filamenta plana antheris breviora, connectivo non producto. *Achænia* immatura in caudam (5 mm.) albo-plumosam producta.

Zemu Valley, 9,000 ft., No. 2671. Only the one shrub seen.

3. **Clematis Buchananiana** DC.
Llonakh, 11,000 ft., No. 1735.

2. Thalictrum Linn.

4. **Thalictrum elegans** Wall.
Llonakh and Thango, 12-15,000 ft., Nos. 1751, 2103, 2473.

5. **Thalictrum cultratum** Wall.
Zemu, Llonakh, and Thango, 10-13,500 ft., Nos. 1221, 1757, 2471, 2675. Common.

Sub-sp. **tsangense** Brühl.

Upper Llonakh, 16,500 ft., No. 2,311. Sparingly. A Tibetan plant, recorded previously from the neighbourhood of Khambajong. If *T. platycarpum* H.f. & T. be an alpine state of *T. cultratum* Wall. the above sub-species would be a still more reduced form. There are, however, as Brühl points out, (Ann. Roy. Bot. Gard. Calc. Vol. V, p. 72) considerable differences in the ripe fruit.

6. **Thalictrum Chelidonii** DC.

Zemu Valley and Thango, 9-12,000 ft., Nos. 2294, 2674. Common.

7. **Thalictrum virgatum** H. f. & T.

Lachen, 7,000 ft., No. 939.

8. **Thalictrum alpinum** Linn.

Yumchho La, Zemu, Llonakh, Naku La, 14-16,000 ft. Frequent.

9. **Thalictrum** sp.

T. alpini Linn. valde affinis ; forsan varietas.

Nana procumbens. Folia bipinnata segmentis linearibus vel angusto-cuneatis.

Very much resembling a reduced *Thalictrum alpinum* Linn. but with different leaf segments and very small flowers. It is not quite matched by any specimen at Kew or Calcutta.

10. **Thalictrum saniculæforme** DC.

Below Lachen, 7,000 ft., No. 912. Apparently rare in Sikkim, as the above is the only type in Herb. Calc. from the area.

11. **Thalictrum javanicum** Bl.

Tong to Lachen. 5-8,000 ft.

12. **Thalictrum foliolosum** DC.

Lachen, 8-9,000 ft.

3.—**Anemone** Linn.

13. **Anemone vitifolia** Ham.

Cheungtong and Lachen, 6-9,000 ft. Common.

14. **Anemone obtusiloba** Don.

Yumchho La, Zemu, and Llonakh, 14-16,000 ft. Not common.

15. **Anemone trullifolia** H. f. & T.

Zemu and Llonakh valleys, Thango, 14-15,000 ft., Nos. 1711, 2011. Not common.

16. **Anemone rivularis** Ham.

Lachen, 8,000 ft., No. 969.

17. **Anemone demissa** H. f. & T.

Zemu Valley and Llonakh, 13-16,000 ft. The common Anemone throughout the two valleys and very variable in size and hairiness and in number and colour of the flowers.

var. **monantha** Brühl

Zemu Valley, 14,500 ft., No. 1362. Not uncommon along with the type.

18. Anemone sp.

A. demissae H. f. & T. valde affinis et forsan varietas. *Folia* glabra; *scapus* infra involucrum floremque capillis albis patentibus indutus; *flores* atro-purpurei; stylus aduncus; *fructus* immaturus hirsutus.

This Anemone appears very different in the field from the others but is, notwithstanding the somewhat hairy ovary, possibly a form of *A. demissa* H. f. & T. var *monantha.*

Yumchho La, 15,000 ft., Nos. 1240, 1292. Sparingly.

19. Anemone polyanthes Don.

Above Lachen, 12,500 ft.

4. **Adonis** Linn.

20. Adonis sp.

A. chrysocyathi H. f. & T. valde affinis; forsan subspecies; parvis floribus, brevi stylo recto, distinguitur. *Folia* multifida *A. chrysocyathi* more. *Flores* 2 cm. diametientes. *Stylus* obtusus perbrevis dum *A. chrysocyatho* longus, attenuatus, revolutus.

Usually very dwarf, (6 cm.) and the flowers less than half those of *A. chrysocyathus*. Possibly the East Himalayan form of that species but the achenes are unlike those of the Western plant at any stage.

Yumchho La, 15,000 ft., No. 1285.

5. **Callianthemum** C. A. Meyer.

21. Callianthemum cachemirianum Camb.

Llonakh and Thango, 13-15,000 ft., Nos. 2109, 2565. Found very sparingly and usually under the shelter of the dwarf Juniper bushes. In the Flora of British India Vol. I, p. 15, the colour is given as white. In the Sikkim specimens the petals, as noted in the field, are purple outside and pink within.

6. **Ranunculus** Linn.

22. Ranunculus aquatilis Linn.

var. **trichophylus.**

Llonakh and Giagong, 15-16,000 ft., No. 1887. In marshy ground and small lakes, not found in Sikkim except near the Tibetan frontier.

23. Ranunculus Cymbalariæ Pursh.

Llonakh and Kangralamo, 15-17,000 ft., Nos. 1900, 1910, 2446.

24. **Ranunculus pulchellus** C. A. Mey.

Zemu and Llonakh, 10-16,000 ft. Common.

var. **longicaulis.**

Llonakh. No. 2086.

var. **sericeus.**

Zemu and Llonakh. Very common above 14,500 ft., Nos. 2089, 2451, etc.

25. **Ranunculus hyperboreus** Rotlb.

Common in the Llonakh marshes, 14,500 ft.

26. **Ranunculus affinis** Br.

Zemu, Llonakh, Thango, Giagong, 13-16,000 ft., Nos. 1290, 1503, 2031. Common.

27. **Ranunculus hirtellus** Royle.

Llonakh, 14,500 ft. Frequent.

28. **Ranunculus diffusus** DC.

Lachen. 7-9,000 ft., No. 917.

29. **Ranunculus flaccidus** H. f. & T.

Zemu Valley, 10-11,000 ft., No. 1078.

7. **Oxygraphis** Bunge.

30. **Oxygraphis glacialis** Bunge.

Naku La, Llonakh, 17,500 ft., No. 1958. Sparingly.

8. **Caltha** Linn.

31. **Caltha palustris** Linn.

Zemu Valley, 10,000 ft., No. 2672.

32. **Caltha scaposa** H. f. & T.

Llonakh, 14-17,000 ft., Nos. 1925, 1942, 2212. Common.

9. **Trollius** Linn.

33. **Trollius pumilus** Don.

Llonakh, 14,500 ft., No. 1852. Sparingly.

10. **Isopyrum** Linn.

34. **Isopyrum microphyllum** Royle.

Llonakh, 16-17,000 ft., No. 2313. A west Himalayan and Tibetan plant, not previously recorded from Sikkim.

Not identical with I. *grandiflorum* Fisch.

11. Delphinium Linn.

35. **Delphinium cæruleum** Jacq.
Frequent in the Llonakh Valley from 14,500-17,000 ft. Nos. 1935, 2017, 2102, 2131.

36. **Delphinium glaciale** H. f. & T.
Rongsa, Llonakh, 15,500 ft., No. 2017. Sparingly.

12. Aconitum Linn.

37. **Aconitum luridum** H. f. & T.
Nangna La and Thango. Sparingly.

38. **Aconitum laciniatum** Stapf.
Zemu, 11,000 ft.

39. **Aconitum spicatum** Stapf.
Thango, 14,000 ft.

40. **Aconitum Hookeri** Stapf.
Thango, 14,000 ft.

13. Cimicifuga Linn.

41. **Cimicifuga fœtida** Linn.
Zemu Valley, 12,000 ft., No. 1640. Occasional.

II.—MAGNOLIACEÆ.

14. Magnolia Linn.

42. **Magnolia Campbellii** H. f. & T.
Cheungtong and Lachen 6-8,000 ft.

43. **Magnolia globosa** H. f. & T.
Zemu Valley and Lachung, 9-10,000 ft., Nos. 2593, 2728.

15. Michelia Linn.

44. **Michelia lanuginosa** Wall.
Cheungtong, 6,000 ft.

16. Schizandra Michaux.

45. **Schizandra grandiflora** H. f. & T.
Zemu, 10,000 ft., No. 2729.

III.—MENISPERMACEÆ.

17. Stephania Lour.

46. **Stephania rotunda** Lour.
Tong, 4,500 ft., No. 861.

IV.—BERBERIDEÆ.

18. Decaisnea H. f. & T.

47. **Decaisnea insignis** H. f. & T.
Lachen, 8-10,000 ft., No. 954. Not common.

19. Berberis Linn.

48. **Berberis nepalensis** Spreng.
Cheungtong and Lachen, 6-8,000 ft. Frequent.

49. **Berberis umbellata** Wall.
Lachen, 8,000 ft.

50. **Berberis aristata** DC.
var. **micrantha.**
Lachen and Zemu, 8-10,000 ft., Nos. 976 2754.

51. **Berberis Wallichiana** DC.
Lachen and Zemu, 8-10,000 ft., No. 1056.
var. **atro-viridis.**
Lachen, 10,000 ft., No. 2530.

52. **Berberis angulosa** Wall.
Zemu, Llonakh, and Giagong, 12-15,000 ft., Nos. 1199, 1675, 2866 Ribu.

53. **Berberis macrosepala** H. f.
Zemu, 14-15,000 ft., No. 1492. Not uncommon.

54. **Berberis concinna** H. f.
Llonakh, 14,500 ft., No. 1816.

20. Podophyllum Linn.

55. **Podophyllum emodi** Wall.
Zemu, lower Llonakh, and Thango, 11-14,000 ft. Occasional.

V.—PAPAVERACEÆ.

21. Meconopsis Vig.

56. **Meconopsis horridula** H. f. & T.
Llonakh, 15-16,000 ft., No. 2015. Frequent.

57. **Meconopsis paniculata** Prain.
Zemu Valley, 10-14,000 ft. Very plentiful.

58. **Meconopsis simplicifolia** Walp.
Zemu Valley, 12-16,500 ft., Nos. 1183, 1557. Common.

22. **Cathcartia** Hook. f.

59. **Cathcartia villosa** Hook. f.

Zemu Valley, 10,000 ft., No. 1077.

60. **Cathcartia lyrata** Cummins and Prain.

Nachegoh, 15,000 ft. Only one plant seen.

VI.—FUMARIACEÆ.

23. **Hypecoum** Tourn.

61. **Hypecoum leptocarpum** H. f. & T.

Llonakh, Naku La, and Giagong, 14-16,500 ft., Nos. 1848, 1898, 2400. Very common on the Llonakh flats.

24. **Dicentra** Bork.

62. **Dicentra Roylei** H. f. & T.

Tista Valley, 4,500 ft., No. 831.

25. **Corydalis** D. C.

63. **Corydalis cashmeriana** Royle
var. **ecristata** Prain.

Zemu Valley, Yumchho La, Llonakh, 14-17000 ft., Nos. 1256, 1574, 2041, etc. Very common among the stones at the higher elevations.

64. **Corydalis trifoliolata** Franch.

Zemu Valley, 16,000 ft., No. 1416.

65. **Corydalis lathyroides** Prain.

Zemu Valley, 12,000 ft., No. 1635. Sparingly. Not previously recorded from Sikhim.

66. **Corydalis graminea** Prain.

Llonakh, 15,000 ft., No. 1883.

67. **Corydalis polygalina** H. f. & T.

Llonakh, 14,500 ft., No. 2104.

68. **Corydalis juncea** Wall.

Zemu Valley, 14-16,000 ft., Nos. 1479, 1493.

69. **Corydalis flaccida** H. f. & T,

Zemu Valley, 12-13,000 ft., Nos. 1153, 1674.

70. **Corydalis** sp.

Corydalis crithmifoliæ Royle affinis habitu, longitudine, rhizomate; caulinis ternatis foliis, brevi obtuso calcare distincta. *Rhizoma* fusiforme vetustorum foliorum reliquiis indutum. *Caulis* ad 15 cm. debilis. *Foliorum radicalium* vaginæ marcidæ solum supersunt; *folia caulina* 2-3 in apice collecta, ternata, lateralibus segmentis 1 cm. longis ellipticis integris sessilibus, tertio obovato trifido. *Racemus* 5-6 florifer; *flores* 1·2 cm. longi; *bracteæ* ad 2 cm. longæ, tertio foliorum segmento similes vel oblongæ integræ; pedicelli ad 1·8 cm. *Petala* obtusa cærulea calcare obtuso. Gynæceum *C. crithmifolia*.

Llonakh, 16,000 ft., No. 2237. Not matched at Kew or Calcutta. Specimens are somewhat imperfect.

71. **Corydalis mucronifera** Maxim.

Giagong, 16,500 ft., No. 2456. Sparingly.

A Tibetan plant not previously recorded from Sikkim.

72. **Corydalis Hendersonii** Hems.

Naku La, Llonakh, 17,500 ft., No. 1957.

Not previously found in Sikkim.

DISTRIBUTION.—Tibet, Yarkand, N. W. Himalaya.

73. **Corydalis Casimiriana** Duthie & Prain.

Zemu, 10-13,000 ft., Nos. 1501, 2795.

74. **Corydalis chærophylla** DC.

Zemu, 11,000 ft., No. 1659.

75. **Corydalis Hookeri** Prain.

Upper Llonakh 16,000 ft., No. 2244. Sparingly. Larger than our Tibetan types in the Calcutta Herbarium but referable I think to this species. A Tibetan plant, crossing into Sikkim near the frontier.

76. **Corydalis meifolia** Wall.

var. **sikkimensis**.

Zemu Valley, 14-16,000 ft., Nos. 1435, 1556.

77. **Corydalis Stracheyi** Duthie.

Yumchho La, 15,000 ft., No. 1281.

78. **Corydalis ophiocarpa** H. f. & T.

Zemu Valley, 9,000 ft., No. 2794.

VII.—CRUCIFERÆ.

26. Parrya Br.

79. **Parrya platycarpa** H. f. & T.

Llonakh, 16-17,000 ft., Nos. 2233, 2361. Sparingly near the snow in the more remote valleys. Some of the specimens have fruits longer and narrower and are possibly referable to *Parrya exscapa* Ledeb.

27. Nasturtium Br.

80. **Nasturtium palustre** DC.

Lachen and Zemu, 8-10,000 ft., Nos. 984, 2677.

81. **Nasturtium** sp.

Llonakh, 14,000 ft., No. 2073. In a young state and not matched in Calcutta Herbarium.

28. Arabis Linn.

82. **Arabis glandulosa** Kar. & Kir.

Llonakh, Naku La, and Giagong, 14-17,500 ft., Nos. 1902, 1953, 2397.

29. Cardamine Linn.

83. **Cardamine circæoides** H. f. & T.

Tong, 5,000 ft., No. 869.

84. **Cardamine hirsuta** Linn.

var. **sylvatica**.

Zemu and Llonakh, 10-12,000 ft., Nos. 1157, 1746.

85. **Cardamine macrophylla** Willd.

Zemu and Lower Llonakh, 8-13,000 ft., No. 1012. Very common.

30. Loxostemon H. f. & T.

86. **Loxostemon pulchellus** H. f. & T.

Zemu, 15-16,000 ft., Nos. 1419, 1577. Not uncommon. In flower only, not in fruit.

31. Draba Linn.

87. **Draba alpina** Linn.

Very common from 14-17,000 ft., in both valleys.

88 **Draba elata** H. f. & T.

Zemu, Llonakh, and Thango, 12-15,000 ft., Nos. 1404, 1626, 1648, 2535. Frequent.

89. **Draba incana** Linn.

Llonakh, 14-15,000 ft., Nos. 2043, 2807 Ribu.

90. **Draba lasiophylla** Royle.

Zemu, Llonakh, and Giagong, 12-17,000 ft., Nos. 1844, 2042, 2144, 2676. Frequent.

91. **Draba tibetica** H. f. & T.

Llonakh and Giagong, 15-17,000 ft., Nos. 2304, 2884 Ribu.

92. Draba gracillima H. f. & T.

Zemu, Yumchho La, 10-15,000 ft., Nos. 1160, 1164, 1318, 1601 Frequent.

32. Cochlearia Linn.

93. Cochlearia scapiflora H. f. & T.

Llonakh, 16-18,000 ft., Nos. 1954, 2176.

94. Cochlearia ? serpens W. W. Smith sp. nov.

Planta anomala in genere *Cochlearia* dubie posita. Fortasse genus novum.

Nana, annua, fere glabra, serpens. *Caules* sinuosi intexti, 3-10 cm. longi internodis prælongis. *Folia* sparsa; radicalia desunt; caulina 4-7 mm. longa, plerumque spathulata, trilobata vel tripartita vel rarius integra, petiolo 4-7 mm. *Flores* racemo laxissimo 1-5; bracteæ foliis similes; pedicelli graciles flexiles, in fructu ad 3 cm. longi. *Sepala* 1 mm. longa, elliptica, æqualia. *Petala* 2 mm. longa, fere orbiculata, unguiculata, violacea. *Stamina* recta corollam æquantia filamentis latis. *Ovarii* ovoidei longitudine stylus. *Siliqua* 1-locularis, variabilis, vel brevis, globosa, 1-seminifera, vel elongata oblonga, 3-4-seminifera, 4-7 mm. longa, ± falcata. *Semina* 1-2 mm. longa 1-seriata, nigra testa laevi; cotyledones accumbentes.

Sikkim Himalaya, at Jongri, 14,000 ft. Gammie No. 156, Watt. No. 5795 in Herb. Kew.; Yumchho La, Zemu Valley, 14,000 ft., Nos. 1269, 1544 Smith & Cave. Mr. W. G. Craib after comparison with the types at Kew considers it near *Cochlearia Hobsoni* Pearson if it is a *Cochlearia* but agrees with me that its position is doubtful.

33. Sisymbrium Linn.

95. Sisymbrium himalaicum H. f. & T.

Zemu Valley, 9-13,000 ft., common.

96. Sisymbrium Sophia Linn.

Llonakh, 16,000 ft.

97. Sisymbrium deltoideum H f. & T.

Llonakh, 14,000 ft. No. 2082. Only seen once.

34. Eutrema Br.

98. Eutrema himalaicum H. f. & T.

Zemu, 13-15,000 ft., Nos. 1495, 1684. Very common along the Tumrachen Chu, a tributary of the Zemu, beside the grazing grounds.

35. **Erysimum** Linn.

99. **Erysimum deflexum** H. f. & T.
Giagong 15-16,000 ft., Nos. 2439, 2457.

100. **Erysimum funiculosum** H. f. & T.
Naku La, Llonakh, 17,000 ft., No. 1937 bis.

101. **Erysimum longisiliquum** H. f. & T.
Thango, 13,000 ft., No. 2281.

36. **Braya** Sternb. & Hoppe.

102. **Braya rosea** Bunge.
Zemu, Yumchho La, and Llonakh, 15-16,000 ft., Nos. 1326, 1512, 1719, 2033.

103. **Braya tibetica** H. f. & T.
Llonakh, 16-17,000 ft., Nos. 2305, 2351. Previously recorded only from W. Tibet.

37. **Capsella** Moench.

104. **Capsella Bursa pastoris** Moench.
Lachen and Thango.

105. **Capsella Thomsoni** H. f.
Naku La, Llonakh, and Giagong, 15-17,000 ft., Nos. 1926, 2840. A West Tibet plant not previously recorded for Sikkim.

38. **Lepidium** Linn.

106. **Lepidium capitatum** H. f. & T.
Llonakh, Giagong, and Kangralamo, 15-16,000 ft., Nos. 1833, 2453,

39. **Dilophia** Thoms.

107. **Dilophia salsa** Thoms.
Llonakh, 14,500 ft., No. 1922. Sparingly. A Tibetan plant not previously found within the Indian area. It occurs in the flats by the river. The specimens are in both flower and fruit. In dehiscence the two crested valves come away in a fashion recalling the calyptra of mosses or the capsule of *Anagallis*.

40. **Thlaspi** Linn.

108. **Thlaspi arvense** Linn.
Lachen, 8-10,000 ft.

109. Thlaspi alpestre Linn.
Naku La, Llonakh, 15-17,000 ft., Nos. 2117, 2145.

110. Thlaspi cochlearioides H. f. & T.
Yumchho La, Zemu, and Llonakh, 14-15,000 ft., Nos. 1278, 2019, 2025, 2039.

VIII.—VIOLACEÆ

41. Viola Linn.

111. Viola biflora Linn.
Lachen, Zemu, and Llonakh, 7-16,000 ft., Nos. 937, 1560, 1918. Frequent.

112. Viola kunawarensis Royle.
Llonakh, 14,500 ft., Nos. 1838, 2738. Very dwarf ; frequent.

IX.—POLYGALEÆ.

42. Polygala Linn.

113. Polygala arillata Ham.
Tong, Lachen, 5-8,000 ft., Nos. 883, 2750.

X.—CARYOPHYLLEÆ.

43. Gypsophila Linn.

114. Gypsophila cerastioides Don.
Zemu, 9-12,000 ft., Nos. 1033, 1218.

44. Silene Linn.

115. Silene Stracheyi Edgew.
Zemu and Thango, 10-13,000 ft., Nos. 2701, 3092 Ribu.

45. Cucubalus Linn.

116. Cucubalus bacciferus Linn.
Lachen and Zemu, 8-10,000 ft., Nos. 972, 2417.

46. Lychnis Linn.

117. Lychnis apetala Linn.
Zemu, Naku La, Llonakh, 13-17,000 ft., Nos 1472, 1878, 1899. Common.

118. Lychnis nigrescens Edgew.

Zemu, Llonakh, and Thango, 11-16,000 ft., Nos. 2248, 2498. Frequent.

119. Lychnis himalayensis Edgew.

Zemu Valley, 10-12,000 ft., No. 1095.

120. Lychnis brachypetala Hort. Berol.

Naku La, Llonakh, 14-16,000 ft., Nos. 1897, 2242, 2700.

121. Lychnis multicaulis Wall.

Zemu, 11,000 ft., No. 2699.

122. Lychnis indica Benth ?

Lachung, 8,000, No. 2577.

123. Lychnis nutans Benth.

Zemu, 11,000 ft., No. 2698.

47. Cerastium Linn.

124. Cerastium vulgatum Linn.

Lachen, Zemu, Llonakh, and Thango, 7-14,000 ft. Only near the villages, and old cattle-stations.

48. Stellaria Linn.

125. Stellaria paniculata Edgew.

Lachen and Tallum Samdong, 7-12,000 ft.

126. Stellaria media Linn.

Lachen, 8-9,000 ft.

127. Stellaria lanata Hook. f.

Zemu, 10-11,000 ft., Nos. 1159, 1168.

128. Stellaria longissima Wall.

Lachen, 8-11,000 ft., No. 937.

129. Stellaria uliginosa Linn.

Zemu and Llonakh, 12-16,000 ft., Nos. 1874, 2183.

130. Stellaria subumbellata Edgew.

Llonakh, 14-16,000 ft., Nos. 1874, 1977.

131 Stellaria decumbens Edgew.

Zemu, 11-13,000 ft., Nos. 1151, 1409.

var. **minor.**

Zemu, 11,000 ft., No. 1166.

var. **pulvinata**

Thé La, Jongsong La Valley, Llonakh, 16-17,000 ft., Nos. 2180, 2241, 2256, 2327. Common.

var. **polyantha.**

Zemu, Naku La, Llonakh, 12-17,000 ft., Nos. 1338, 1406, 1880, 1929. Common.

var. **acicularis.**

Thé La, Llonakh, and Thango, 14-16,500 ft., Nos. 1827, 2045, 2178. Common.

49. Arenaria Linn.

132. Arenaria musciformis Wall.

Llonakh and Thango, 14-17,000 ft., Nos. 1517, 1729, 1820, 2027, Frequent.

133. Arenaria polytrichoides Edgew.

Zemu and Llonakh, 14-17,000 ft., Nos. 1517, 1729, 1880, 2027. Frequent.

134. Arenaria monticola Edgew.

Thango, 14,500 ft., No. 2545.

135. Arenaria pulvinata Edgew.

Llonakh, 14,500 ft., No. 2095.

136. Arenaria densissima Wall.

Nangma La and Ghoraphu Chu in Llonakh, 15-16,000 ft., Nos. 2199, 2816 Ribu. Rare. Recorded previously from Nepal and Tibet not from Sikkim.

137. Arenaria orbiculata Royle.

Zemu Valley, 12-13,000 ft., Nos. 1232, 1671. Lachung, 8,000 ft. No. 2576.

138. Arenaria ciliolata Edgew.

Naku La, Llonakh, Kangralamo, and Thango, 14-16,000 ft. Nos. 1807, 1850, 1963, 2258, 2567. Common.

139. Arenaria glanduligera Edgew.

Llonakh, 14-17,000 ft., Nos. 2048, 2335. Common.

var. **micrantha.**

Zemu and Llonakh, 15-17,000 ft., Nos. 1466, 1726, 2120, 2364, Very common.

140. Arenaria Stracheyi Edgew.

Llonakh, 14,500 ft., No. 2119. A Tibetan plant. Previously also from Chumbi, not from Sikkim.

141. Arenaria cerastiiformis Williams.

Llonakh, 16-17,000 ft., Nos. 2112, 2346. Recorded from Chumbi and Giagong.

142. Arenaria melandryoides Edgew.

Zemu Valley and Llonakh, 14-17,000 ft., Nos. 1485, 1541, 1783, 1976. Common.

143. Arenaria debilis Hook. f.

Zemu and Llonakh, 14-16,000 ft., Nos. 1415, 1514, 1793.

144. Arenaria Littledalei Hemsl.

Naku La, Llonakh, 16,000 ft., No. 1984. A Tibetan plant, not previously recorded from Sikkim.

145. Arenaria thangoensis W. W. Smith. sp. nov.

A. Littledalei Hems. affinis; sed pentamera et caule viscoso-pubescente, sepalis ciliatis distincta.

Parva, annua, viscoso-pubescens. *Caulis* 2-3 cm. altus, pluries dichotomus, rigidulus. *Folia* 3-4 mm. longa, opposita, lanceolata, fere sessilia. Cymi pauciflori, pedicelli graciles divaricati, flores parvi. *Sepala* quinque, 1·5 mm. longa, lineari-lanceolata, ciliata; *petala* nulla; *stamina* quinque 7-8 mm. longa; *styli* duo; *ovarium* ovoideum in fructu calycem excedens, quadrivalve, seminibus paucis.

Thango, 13-14,000 ft., No. 2572.

50. Sagina Linn.

146. Sagina procumbens Linn.

Naku La, Llonakh, 14-16,000 ft.

XI.—TAMARISCINEÆ.

51. Myricaria Desv.

147. Myricaria germanica Desv.

Zemu Valley, 11,000 ft., No. 1101. Frequent.

XII.—HYPERICINEÆ.

52. Hypericum Linn.

148. Hypericum Hookerianum W. & A.

Lachen and Zemu Valley, 7-9,000 ft., Nos. 943, 2758.

49. **Hypericum patulum** Thumb.
Tong 5,000 ft., No. 879.

150. **Hypericum reptans** H. f. & T.
Lachen, Zemu, and Lachung, 8-10,000 ft., Nos. 2614, 2746, 2776.

151. **Hypericum petiolulatum** H. f. & T.
Tong, Lachen, and Zemu Valley, 5-9,000 ft., Nos. 854, 2736.

152. **Hypericum elodeoides** Choisy.
Zemu, 11,000 ft., No. 2783.

153. **Hypericum monanthemum** H. f. & T.
Zemu Valley and Thango, 12-13,000 ft., Nos. 1208, 1392, 2537.

XIII.—TERNSTRŒMIACEÆ.

53. **Eurya** Thunb.

154. **Eurya japonica** Thunb.
Lachen, 9,000 ft., Nos. 2371, 2743.

54. **Actinidia** Lindl.

155. **Actinidia callosa** Lindl.
Lachen, 7,000 ft., No. 946.

XIV.—MALVACEÆ.

55. **Dicellostyles** Benth.

156. **Dicellostyles jujubifolia** Benth.
Tong, 5,000 ft., No. 880.

XV.—STERCULIACEÆ.

56. **Abroma** Jacq.

157. **Abroma augusta** Linn.
Cheungtong, 5,000 ft.

XVI.—GERANIACEÆ.

57. **Geranium** Linn.

158. **Geranium collinum** M.Bieb.
Zemu Valley and Llonakh, 12-16,000 ft., Nos. 1192, 1571, 1861.

159. **Geranium Grevilleanum** Wall.
Lachen and Lachung, 8-10,000 ft., Nos. 2532, 2616

160. Geranium nepalense Sweet.
Cheungtong, 6,000 ft.

161. Geranium polyanthes Edgew. & Hook. f.
Zemu Valley, 8-12,100 ft., Nos. 1013, 1190.

58. Oxalis Linn.

162. Oxalis Acetosella Linn.
Zemu, 8,500 ft., No. 1023.

59. Impatiens Linn.

163. Impatiens sulcata Wall.
Zemu, 12-13,000 ft., Nos. 1654, 1655.

164. Impatiens radiata Hk. f.
Cheungtong, Lachen, and Zemu, 10-12,000 ft., Nos. 905, 2377, 2846.

165. Impatiens longipes H. f. & T.
Above Lachen.

166. Impatiens drepanophora Hk. f.
Tong, 5,000 ft., No. 850.

167. Impatiens spirifer H. f. & T.
Tong, 5,000 ft., No. 859.

168. Impatiens puberula DC.
Tong, 5,000 ft., No. 870.

169. Impatiens decipiens Hk. f.
Tista Valley, 4,000 ft., No. 805.

170. Impatiens falcifer Hk. f.
Zemu Valley, 1,0000 ft., No. 2836.

XVII.—RUTACEÆ.

60. Evodia Forst.

171. Evodia rutæcarpa H .f. & T.
Lachung, 9,000 ft., No. 2620.

61. Zanthoxylum Linn.

172. Zanthoxylum oxyphyllum Edgew.
Zemu, 9,000 ft., No. 2784.

62. **Skimmia** Thunb.

173. **Skimmia Laureola** Hook. f.
Above Lachen, 10-11,000 ft.

XVIII.—ILICINEÆ.

63. **Ilex.** Linn.

174. **Ilex intricata** Hook. f.
Zemu, 10,000 ft., No. 1075.

175. **Ilex fragilis** Hook. f.
Lachen 8,000 ft., No. 2851.

XIX.—CELASTRINEÆ.

64. **Euonymus** Linn.

176. **Euonymus frigidus** Wall.
Zemu, 9-10,000 ft., No. 1051.

177. **Euonymus Hamiltonianus** Wall.
Tista Valley, 4-5,000 ft., No. 834.

65. **Celastrus** Linn.

178. **Celastrus stylosa** Wall.
Lachen, 8,000 ft., No. 964.

XX.—RHAMNEÆ.

66. **Berchemia** Neck.

179. **Berchemia floribunda** Wall.
Zemu Valley and Lachung, 9-10,000 ft., Nos. 2598, 2785.

180. **Berchemia lineata** DC.
Zemu Valley, 9,000 ft., No. 2852.

67. **Gouania** Linn.

181. **Gouania leptostachya** DC.
Tong, 4,500 ft., No. 862.

XXI.—SAPINDACEÆ.

68. **Acer** Linn.

182. **Acer Hookeri** Miq.
Lachung, 8,000 ft., No. 2582.

183. Acer stachyophyllum Hiern.
Zemu, 9,000 ft., No. 2777.

184. Acer villosum Wal!
Zemu, 9,000 ft., No. 2735.

185. Acer pectinatum Wall.
Zemu, 8-10,000 ft., Nos. 1009, 1039, 2773.

186. Acer Campbellii Hook. f. & T.
Cheungtong, 6,000 ft.

187. Acer Papilio King.
Zemu, 11,000 ft., No. 1104.

XXII.—SABIACEÆ.

69. Meliosma Bl.

188. Meliosma dilleniæfolia Wall.
Lachen, 8-9,000 ft., No. 956.

XXIII.—CORIARIEÆ.

70. Coriaria Linn.

189. Coriaria nepalensis Wall.
Lachen, Zemu Valley, and Thango, 8-11,000 ft., Nos. 988, 2525. Common.

XXIV.—LEGUMINOSÆ.

71. Piptanthus D. Don.

190. Piptanthus nepalensis D. Don.
Zemu, 9,000 ft., No. 2772.

72. Thermopsis R. Br.

191. Thermopsis barbata Royle.
Thango, 13,000 ft., No. 2285.

73. Parochetus Ham.

192. Parochetus communis Ham.
Zemu Valley, 8-12,000 ft., Nos. 1014, 1155, 2741. Common.

74. Indigofera Linn.

193. Indigofera Dosua Ham.
var. **tomentosa.**
Tista Valley, 3-4,000 ft., No. 819.

75. Caragana Lam.

194. Caragana crassicaulis Benth.
Zemu and Llonakh, 14-16,000 ft., Nos. 1489, 1715, 1777, 2793. Frequent.

76. Guldenstædtia Fisch.

195. Guldenstædtia himalaica Baker.
Llonakh, 14-15,000 ft., Nos. 1843, 2100.

77. Astragalus Linn.

196. Astragalus pycnorhizus Wall.
Zemu and Llonakh, 9-13,000 ft, Nos. 1047, 1207, 2774. Frequent.

197. Astragalus zemuensis W. W. Smith. sp. nov.

Species *A. pycnorhizi* Wall. affinis; foliolis albo-hirsutis, magnis connatis stipulis, fructu majore inter alia distinguenda est.

Radix lignosa fusiformis. *Caules* plures decumbentes, ad 6 cm. longi, internodis multum contractis, vetustorum foliorum reliquiis induti. *Folia* 5-7 cm. longa, 11-13 foliolis ellipticis integris 6-7 mm. longis, albo-hirsutis; petiolo 3-4 cm. longo; stipulis 3-4 mm. longis connatis vaginantibus in duos lobos lineares divisis, albo-hirsutis. *Pedunculi* folia æquantes vel minores, 2-4 floriferi, sparse adpresse pubescentes; pedicelli 2 mm. longi bracteis lineari-lanceolatis hirsutis. *Calyx* 7-8 mm. longus albis nigrisque capillis sparse vestitus lobis linearibus fere tubum aequantibus. *Corolla* 1 cm. longa purpurea. *Gynæceum A. pycnorhizi. Legumen* 3-4 cm. longum, 1-1·2 cm. latum breviter stipitatum ellipticum, inflatum, primo nigro-hirsutum, demum glabrescens, ±20 seminibus.

Zemu Valley, 12,000 ft., No. 1222.

198. Astragalus confertus Benth ?
Naku La, Llonakh, 14-16,000 ft., Nos. 1830, 1853, 1990.

199. Astragalus sp.
Sepo La, 17,000 ft., No. 2396 near *A. hypoglottoides* Baker.

200. Astragalus lessertioides Benth.
Zemu Valley, Naku La, Llonakh, 12-16,000 ft., Nos. 1224, 1773.

201. **Astragalus strictus** Grah.
Llonakh, 14,16,000 ft., No. 1774.

202. **Astragalus sikkimensis** Benth.
Zemu and Llonakh, 12-13,000 ft., Nos. 1209, 2775.

203. **Astragalus floridus** Benth.
Llonakh, 14,500 ft.

204. **Astragalus chlorostachys** Lindl.
Lachen, 8,000 ft., No. 968.

205. **Astragalus xiphocarpus** Benth.
Llonakh, 14,500 ft., No. 2722 Ribu.

206. **Astragalus stipulatus** D. Don.
Cheungtong and Lachen, 7-8,000 ft., Nos. 2609, 3022 Ribu.

207. **Astragalus** sp.
Thango, 14,000 ft., No. 2839 Ribu. Not matched in Calc. Herb. In fruit only.

78. **Oxytropis** D.C.

208. **Oxytropis lapponica** Gaud.
var. **xanthantha** Baker.
Llonakh, 14,500 ft., Nos. 1859, 2099.

209. **Oxytropis sulphurea** Ledeb.
Llonakh, 14-16,000 ft., Nos. 1889, 2243. A Siberian and Tibetan plant.

210. **Oxytropis tatarica** Jacq.
Llonakh, 15,000 ft., Nos. 2142, 2728 Ribu. A Tibetan and West Himalayan plant, not previously recorded from the Sikkim area. The pods of the Sikhim plant have however two seeds only.

79. **Hedysarum** Linn.

211. **Hedysarum sikkimense** Benth.
Zemu and Llonakh, 12-14,000 ft., Nos. 1136, 2056.

80. **Stracheya** Benth.

212. **Stracheya tibetica** Benth.
Naku Chu, Llonakh, 14-15,000 ft., Nos. 1832, 1890.

81. **Desmodium** Desv.

213. **Desmodium tiliæfolium** G. Don.
Cheungtong, 6,000 ft.

82. **Pueraria** DC.

214. **Pueraria peduncularis** Grah.
Lachen, 7,000 ft., No. 931.

83. **Mezoneurum** Desf.

215. **Mezoneurum cucullatum** W. & A.
var. **grandis.**
Tong. 4-5,000 ft., No. 875.

XXV.—ROSACEÆ.

84. **Prunus** Linn.

216. **Prunus rufa** Wall.
Lachen, 10,000 ft.

217. **Prunus Puddum** Roxb.
Cheungtong to Lachen 5-8,000 ft.

218. **Prunus nepalensis** Ser.
Above Lachen, 10,000 ft.

85. **Maddenia** Hook. f. & T.

219. **Maddenia himalaica** H. f. & T.
Zemu Valley, 8-9,000 ft., No. 995.

86. **Spiraea** Linn.

220. **Spiraea Aruncus** Linn.
Zemu Valley, 9-13,000 ft., Nos. 1141, 2765. Occasional.

221. **Spiraea bella** Sims.
Lachen, Zemu Valley, and Lachung, 8-12,000 ft., Nos. 1040, 1092, 1176, 2599. Frequent.

222. **Spiraea micrantha** Hook. f.
Lachen and Zemu, 8-9,000 ft., No. 2705.

223. **Spiraea arcuata** Hook. f.
Zemu Valley and lower Llonakh, 13-14,000 ft., Nos. 1692, 2706.

224. **Spiraea ulicina** Prain.
Jongsong La Valley and Goraphu Chu, Llonakh, 16,000 ft. Nos. 2222, 2328. A Tibetan plant not previously recorded from Sikkim.

87. **Rubus** Linn.

225. **Rubus reticulatus** Wall.
Zemu Valley, 10,000 ft., No. 2712.

226. **Rubus fragarioides** Bertol.
Zemu Valley, 13-14,000 ft., Nos. 1351, 1382.

227. **Rubus lineatus** Reinw.
Tong. 5,000 ft.

228. **Rubus niveus** Wall.
Zemu and Llonakh, 8-12,000 ft., Nos. 1027, 1744.

229. **Rubus lasiocarpus** Smith.
Tong, 5,000 ft.

88. **Neillia** Don.

230. **Neillia rubiflora** Don.
Zemu, 8-9,000 ft., No. 1019.

89. **Coluria** Br.

231. **Coluria longifolia** Maxim.
Naku La, 16,000 ft., No. 237 Younghusband.

90. **Fragaria** Linn.

232. **Fragaria vesca** Linn.
var. **nubicola.**
Cheungtong and Lachen, 6-7,000 ft., No. 896, 942.

91. **Potentilla** Linn.

233. **Potentilla Sibbaldi** Haller.
Zemu and Llonakh, 14-16,000 ft., Nos. 1342, 2703.
var. **micrantha.**
Zemu, 16,000 ft., No. 1421.

234. **Potentilla perpusilloides** W. W. Smith, sp. nov.

Sectionis *Sibbaldiæ* species et *Potentillæ perpusillæ* Hook. f. affinis; floribus majoribus, solitariis, sessilibus, pentameris, albis, distinguitur.

Magnitudo habitusque *Potentillæ perpusillæ* consimiles. *Folia* ad 6 mm., ternata, segmentis ad 3 mm., longis, *Potentillæ perpusillæ* more 3-5 fidis; interdum subglabra, interdum marginibus longe-ciliatis. *Sepala* et epicalycis segmenta ad 2 mm. longa, marginibus ciliatis.

Petala calycem duplo excedentia, ad 4 mm. longa, orbicularia, alba. *Stamina* decem perbrevia. *Achænia* ± 12 glabra.

Sikkim Himalaya in the Zemu valley at an elevation of 14-15,000 ft Very near but not the *Potentilla perpusilla* of Hooker, being distinguished by the glabrate leaves and the white pentamerous corolla, which much exceeds the calyx.

235. **Potentilla purpurea** Royle.

Zemu and Llonakh, 15-16,000 ft., Nos. 1488, 1581, 2200. The Sikkim specimens have entire leaflets and the flowers tetramerous but are referable, I believe, to this species.

236. **Potentilla albifolia** Wall.

Zemu and Llonakh, 14-15,000 ft., No. 1254.

237. **Potentilla fruticosa** Linn.

Zemu and Llonakh, 11-16,000 ft. Very common over the whole area and one of the conspicuous plants of the arid region.

var. **armerioides.**

Upper valleys of Llonakh, 16,500-17,000 ft., No. 2330.

238. **Potentilla ambigua** Camb.

Zemu and Llonakh, 10-16,000 ft., Nos. 1068, 1197, 1424, 1505, 1760. Frequent.

239. **Potentilla eriocarpa** Wall.

Zemu and Llonakh, 12-15,000 ft., Nos. 2037, 2197, 2702. A conspicuous plant in crevices of the cliffs.

240. **Potentilla Mooniana** Wight.

Zemu Valley, 10-12,000 ft., Nos. 1028, 1678.

241. **Potentilla fulgens** Wall.

Tong, Lachen, Thango, 5-13,000 ft. Frequent.

242. **Potentilla Leschenaultiana** Ser.

var **bannehalensis** ?

Thango, 14,000 ft., No. 2534. Doubtful.

243. **Potentilla Griffithii** Hook. f.

Lachen, Zemu, and Llonakh, 8-15,000 ft., Nos. 1849, 2136, 2704, Frequent.

244. **Potentilla peduncularis** Don.

Zemu Valley, 12-16,000 ft., Nos. 1196, 1360, 1548. Frequent.

var. **Clarkei.**

Zemu and Llonakh, 14-15,000 ft., Nos. 1283, 2092.

245. **Potentilla leuconota** Don.
Llonakh, 12-16,000 ft., No. 1770.

246. **Potentilla microphylla** Don.
Zemu and Llonakh, 15-16,000 ft., Nos. 1279, 1422, 1445, 1506, etc. Frequent.

var. **glabriuscula** Wall.
Zemu Valley, 13,000 ft., Nos. 1378, 1536.

var. **achilleæfolia.**
Zemu and Llonakh, 15-17,000 ft., Nos. 1258, 1570, 2008. Frequent.

var. **commutata.**
Zemu and Llonakh, 14-17,000 ft., Nos. 1348, 2182.

247. **Potentilla sericea** Linn.
var. **compacta** var. nov.

Planta forsan ad *P. sericeam* referenda sed *Potentillis* in Herb. Kew. et Herb. Calc. omnibus dissimilis.

Perpusilla in globum compacta, 6 cm. diametiens, supra solum 2·5-3 cm. extendens. *Radix* crassus. *Caulis* in 5-10 ramos columnæformes, arcte compressos, vetustis foliis indutos, divisus. *Folia* divisa *P. sericeæ* more segmentis 2-3 mm. longis, argenteo-capillatis. *Flores* inter folia sparsi, solitarii, 3-4 mm. diametientes, ad 5 mm. pedicellati. *Corolla* vix calycem excedens.

The upper valleys of Llonakh, Sikkim, 14,500—15,000 feet, Nos. 1907, 2210.

This Potentilla has the compact 'rosette' habit of the typical Llonakh flora, forming small white mounds like 'incrustations' on the flat wind-swept areas. It is probably a very reduced form of *P. sericea.* In view of the polymorphic character of this latter species and the many specific names already attached to its various forms, I think it better to give the Llonakh plant varietal rank only.

248. **Potentilla argyrophylla** Wall.
var. **leucochroa.**
Zemu, 14,500 ft., No. 1373.

249. **Potentilla nivea** Linn.
Llonakh, 14-16,000 ft., Nos. 1888, 2010, 2038.

92. Agrimonia Linn.

250. **Agrimonia Eupatorium** Linn.
Cheungtong, Lachen, and Zemu, 6-11,000 ft., No. 2707.

93. **Poterium** Linn.

251. Poterium filiforme Hook. f.
Llonakh, 14,500 ft., No. 2088. Frequent on the marshy flats.

252. Poterium diandrum Wall.
Zemu Valley, 12-13,000 ft. Frequent.

94. **Rosa** Linn.

253. Rosa macrophylla Lindl.
Lachen and Zemu, 8-10,000 ft., Nos. 955, 2708.

254. Rosa sericea Lindl.
Lachen and Zemu, 8-13,000 ft.. Nos. 996, 1070, 1188, etc. Common

95. **Pyrus** Linn.

255. Pyrus sikkimensis Hook. f.
Lachen and Zemu Valley, 8-9,000 ft., Nos. 992, 2438, 2711.

256. Pyrus vestita Wall.
Zemu, 9,000 ft., No. 2710.

257. Pyrus foliolosa Wall.
Zemu, 9-10,000 ft., No. 1060.

258. Pyrus microphylla Wall.
Zemu and lower Llonakh 9-14,000 ft., Nos. 1061, 1215

259. Pyrus Wallichii Hook. f.
Lachen, 8,000 ft., No. 949.

96. **Cotoneaster** Linn.

260. Cotoneaster frigida Wall.
above Lachen, 10,000 ft.

261. Cotoneaster acuminata Lindl.
Lachen, Zemu, and Thango, 7-13,000 ft., Nos. 993, 1535, 3071 Ribu
Sometimes prostrate at the higher elevations.

262. Cotoneaster microphylla Wall.
Zemu and Thango, 11-14,000 ft., Nos. 1201, 1211, 2713.

XXVI.—SAXIFRAGACEÆ.

97. **Astilbe** Ham.

263. Astilbe rivularis Ham.
Zemu, 9,000 ft., No. 2761.

98. Saxifraga Linn.

264. Saxifraga cernua Linn.

Llonakh and Thango 14,500-15,000 ft., Nos. 1924, 2150, 3088 Ribu. Sparingly.

Recorded from Eastern Nepal and Chumbi Valley as well as from the West Himalaya.

265. Saxifraga palpebrata H. f. & T.

Llonakh and Thango, 13-14,000 ft., No. 2568. Occasional. Not quite the typical form as the leaves are elliptic and sparingly ciliate.

266. Saxifraga llonakhensis W. W. Smith. sp. nov.

Species ad *S. palpebratam* H. f. & T. spectans sed longis rectis stylis distinctus. Laxe caespitosa, *Caules* complures ad 2-3 cm. longi, (interdum basi foliis vetustis delapsis 2-3 cm. longitudini addenda), debiles, foliosi, fere glabri. *Folia basalia* plerumque desunt; *folia caulina inferiora* multi, 4-5 mm. longa, 1 mm. lata, laxe imbricata, lineari-lanceolata, revoluta, ciliata, interdum aristata; *superiora* similia laxiora. *Pedunculus* ad 1 cm. longus capillis albis (glanduligeris, atro-capitatis) usque ad calycem sparse indutus. *Sepala* ad 3 mm., ovata vel oblonga, obtusa, glabra. *Petala* 4-5 mm. longa, obovata 3-nervia, lutea. *Ovarium* auguste ovatum, stylis parallelis subæquum. *Semina* vix matura.

In Llonakh, and near Thango, N. W. Sikkim, at an elevation of 14,000 ft., Nos. 2049, 2686.

In appearance this species seem to approach *S. palpebrata* and in the leaf recalls *S. aristulata*. Unlike anything in Herb. Kew, or Herb. Calc. and much smaller than its apparent allies.

267. Saxifraga cordigera H. f. & T.

Zemu, Llonakh and Thango 14,000-15,500 ft., Nos. 1467, 1606, 1608, 2265, 2492. Frequent.

268. Saxifraga Lychnitis H. f. & T.

Thé La, Naku La, Llonakh, Giagong, 14-17,000 ft., Nos. 1943, 1963, 2185, 2347, 2688. Not uncommon in moist ground by the side of streams.

269. Saxifraga viscidula H. f. & T.

Llonakh and Thango, 13,500-16,500 ft., Nos. 2317, 2571.

270. Saxifraga aristulata H. f. & T.

Zemu, Llonakh, and Thango, 13-17,000 ft., Nos. 1528, 2044, 2359, 2466 Frequent.

271. Saxifraga saginoides H. f. & T.

Zemu, Llonakh, and Thango, 12-17,000 ft., Nos. 1568, 1730, 1797, 2217, 2326, etc. Very common.

272. Saxifraga Caveana W. W. Smith, sp. nov.

Species *S. saginoides* Hk. f. & T. affinis sed ovatis foliis, et majoribus floribus facile distincta.

Densissime caespitosa; caudiculi arcte imbricato-foliosi; scapi breves (5 mm. vel minores) uniflori laxe rufescenti-pilosi. *Folia* ad 7 cm. longa, ad 4 mm. lata, ovata vel ovato-lanceolata, obtusa; vagina lata ciliata. *Sepala* ad 5 mm. longa, oblonga, obtusa, eglandulosa. *Petala* ad 8 mm. longa, obovata, 5-nervia, sepalis multo majora, lutea. *Capsula* ovata stylis brevibus divaricatis coronata.

Thé La, and Ghoraphu Chu, Llonakh, N. W. Sikkim, at an elevation of 15,500-16,500 ft., Nos. 2181, 2194.

273. Saxifraga Hirculus Linn.

var. **indica**

Naku Chu, Llonakh, 14-17,000 ft., Nos. 2014, 2091, 2694.

274. Saxifraga subdioica (Hook. f.) Engler.

Chortenima La, Naku La, Llonakh, 15-17,000 ft., Nos. 1931, 2302, 2356, 2695.

275. Saxifraga nutans H. f. & T.

Llonakh and Thango, 13-16,000 ft., Nos. 2122, 2238, 2279, 2538.

276. Saxifraga diversifolia Wall.

Zemu, Llonakh, and Thango, 10-15,000 ft., Nos. 1694, 2284, 2696.

var. **parnassifolia**.

Lachen, 9,000 ft., No. 2369.

277. Saxifraga corymbosa H. f. & T.

Thango, 14,000 ft., No. 2697.

278. Saxifraga strigosa Wall.

Tallum Samdong and Thango, 10-14,000 ft., Nos. 2409, 2529.

279. Saxifraga pallida Wall.

Very common throughout the area from 13-17,000 ft., Nos. 1512, 2013, 2208, 2333, etc.

280. Saxifraga micrantha Edgew.

Zemu, Llonakh, and Thango, 11-15,000 ft., Nos. 1170, 1752, 2562 Frequent.

281. Saxifraga imbricata Royle.

Zemu, Llonakh, and Thango, 13-16,000 ft., Nos. 1323, 2564.

var. with reddish leaves and no apical pores.

Ghoraphu Chu, Llonakh, 15,700 ft., No. 2201.

282. **Saxifraga hemisphaerica** H.f. & T.

Jongsong La Valley, Llonakh, 17,000 ft., No. 2325.

283. **Saxifraga perpusilla** H. f. & T.

Nachegoh and Thangchung La in Zemu Valley, 16,000 ft., Nos. 1490, 1491, 1721.

284. **Saxifraga coarctata** W. W. Smith, sp. nov.

Species nana sectionis 'Microphylla'.

Densissime caespitosa caudiculis brevissimis (1·5-2 cm.). *Folia* densissime imbricata, ad 5 mm. longa, coriacea, elliptica vel spathulata, integra vel apice breviter tridentata sparse ciliata vel glabra. *Caules floriferi* breves imbricatis foliis omnino vestiti. *Flores* solitarii sessiles. *Sepala* 1-1·5 mm. fere orbicularia, sparse glandulosa. *Petala* 2-3 mm. fere orbicularia, alba. *Staminorum* filamenta lata, calycem æquantia. *Capsula* immatura stylis erectiusculis brevibus (·5 mm.) coronata.

Yumchho La, 15,000 ft., Nos. 1322, 1329.

285. **Saxifraga inconspicua** W. W. Smith, sp. nov.

Species *Saxifragæ microphyllæ* Royle, valde affinis sed minor; habitu, foliis etiam minutioribus, glabris pedunculis distincta est.

Perpusilla glaberrima, dense caespitose, foliis arcte imbricatis 2-3 mm. longis, lineari-oblongis, obtusis, *Sedi albi* more carnosulis. *Caules floriferi* uniflori brevissimo pedunculo (1-2 mm.) omnino glabri. *Sepala* 1·5-2 mm. erecta glaberrima, foliis similia. *Petala* aequilonga et sepalis similia, augustiora. *Capsula* stylis brevibus erectiusculis coronata.

Yumchho La, Sikkim, at an elevation of 14-16,000 ft., Nos. 1524, 1538.

This saxifrage I at first in the absence of any types at Calcutta ascribed to *S. microphylla* to which it is very closely allied. On a specimen however being sent to Kew for comparison with the original types of *S. microphylla* it was considered to be distinct. It is the smallest described species of *Saxifraga.* It forms a crustaceous covering to the rocks in the vicinity of the pass. In shape and consistency the leaves suggest those of a small *Sedum*; they have a shining greenish lustre; the upper half is closely packed with chlorophyll-containing cells while the lower half is transparent and bladdery. The greenish sepals and petals are remarkably like the leaves in shape, consistency and colour.

826. **Saxifraga Jacquemontiana** Dcne.

Zemu, Llonakh, and Thango, 14-17,000 ft., Nos. 1515, 1723, 1809, 1970, 2188, 2692. Frequent.

287. Saxifraga Stella-aurea H. f. & T.

Zemu, Llonakh, and Thango, 14-17,000 ft., Nos. 1353, 1364, 1367, 1469, 1802, 2047, 2184. Frequent.

288. Saxifraga ramulosa Wall.

Llonakh, 15-17,000 ft., Nos. 2127, 2316, 2362. Sparingly.

289. Saxifraga umbellulata H. f. & T.

Llonakh, Thango, and Giagong, 13-16,000 ft., Nos. 2159, 2223, 2366, 2455, 2558, 2723. Frequent on the Llonakh flats, sparingly elsewhere.

290. Saxifraga brachypoda Don.

Llonakh, 12,000 ft., No. 1769. Sparingly.

291. Saxifraga fimbriata Wall.

Llonakh and Thango, 13-15,000 ft., Nos. 2276, 2467, 2559.

292. Saxifraga filicaulis Wall.

Thango, 14,000 ft., No. 2536.

293. Saxifraga hispidula Don.

Llonakh, 13,000 ft., No. 1772.

294. Saxifraga Brunoniana Wall.

Zemu, Llonakh, and Thango, 10-13,000 ft., Nos. 1230, 1394, 1740, 2373. Not uncommon.

295. Saxifraga pilifera H. f. & T.

Llonakh, 14,500-17,000 ft., Nos. 1808, 2084, 2101, 2146, 2336. Frequent on the Llonakh screes but not seen in the other valleys.

296. Saxifraga flagellaris Willd.

Llonakh and Thango, 14-17,500 ft., Nos. 1831, 1950, 1991, etc. Frequent.

297. Saxifraga purpurascens H. f. & T.

Zemu and Thango, 12-15,000 ft. Frequent.

99. Tiarella Linn.

298. Tiarella polyphylla Don.

Lachen, 8,000 ft., No. 945.

100. Chrysosplenium Linn.

299. Chrysosplenium nepalense Don.

Zemu Valley, 9-10,000 ft., No. 1031.

300. Chrysosplenium alternifolium Linn.

Llonakh, 14-15,000 ft., No. 1842.

301. Chrysosplenium carnosum H. f. & T.
Zemu, Llonakh, and Thango, 14-15,500 ft., Nos. 1319, 1440, 2253, 2519. Frequent on the rocky screes.

101. Parnassia Linn.

302. Parnassia mysorensis Heyne.
Zemu Valley, 11-13,000 ft., Nos. 1244, 1452.

303. Parnassia nubicola Wall.
Zemu and Llonakh, 11-14,000 ft., Nos. 1436, 1736.

304. Parnassia ovata Ledeb.
Zemu and Llonakh, 12-15,000 ft. Frequent.

305. Parnassia pusilla Wall.
Zemu and Thango, 14-16,000 ft., Nos. 1438, 1611, 2518.

102. Hydrang Linn.

306. Hydrangea altissima Wall.
Lachen and Tallum Samdong, 8-11,000 ft.

103. Deutzia Thunb.

307. Deutzia corymbosa Br.
Lachen and Zemu, 7-9,000 ft., Nos. 932, 2762.

104. Philadelphus Linn.

308. Philadelphus coronarius Linn.
Lachen and Zemu, 7-10,000 ft., No. 934.

105. Ribes Linn.

309. Ribes glaciale Wall.
Zemu Valley, 9-11,000 ft., No. 1057.

310. Ribes desmocarpum H. f. &. T.
Zemu Valley, 8-10,000 ft., Nos. 1018, 1041.

311. Ribes luridum H. f. &. T.
Zemu Valley, 11-13,000 ft., Nos, 1198, 1205.

312. Ribes Griffithii Hook. f. & T.
Zemu Valley, 12-13,000 ft., No. 1138.

XXVII.—CRASSULACEÆ.

All the Calcutta material of this order is at present on loan in Europe, for monographic purposes. I have been unable therefore to compare my specimens with herbarium types. M. Hamet however, who is monographing the order for the *Pflanzenreich* and to whom I sent duplicates of all my numbers, nearly 60, has kindly sent me a preliminary note saying that the majority of the Himalayan species are represented in this collection from Llonakh. A detailed list is not yet available.

The following I noted as certainly present.

106. Sedum Linn.

313. **Sedum quadrifidum** Pall.

314. **Sedum himalense** Don.
Zemu, Llonákh, 12-17,000 ft. Common.

315. **Sedum bupleuroides** Wall.
Zemu, Llonakh, 11-14,500 ft., Nos. 1105, 1756, 2727. Frequent.

316. **Sedum elongatum** Wall.
Zemu, Llonakh, 11-12,000 ft., Nos. 1649, 1741.

317. **Sedum fastigiatum** H. f. & T.

318. **Sedum humile** H. f. & T.

319. **Sedum asiaticum** DC.
Zemu, Llonakh, Nos. 1621, 2726. Frequent.

320. **Sedum trifidum** Wall.
Common in the lower Zemu, 8-10,000 ft.

321. **Sedum trullipetalum** H. f. & T.
Llonakh, Thango, Giagong, 14-16,000 ft. Nos. 1904, 2468.

322. **Sedum Jaeschkei** Kurz?
Thango, 14,000 ft., No. 2507.

323. **Sedum multicaule** Wall.
Cheungtong, Lachen 5-8,000 ft., Nos. 888, 2427, 2602.

324. **Sedum perpusillum** H. f. & T.
Naku Chu, Llonakh, 17,000 ft.

107. Triactinia H. f. & T.

325. **Triactinia verticillata** H. f. & T.
Lower Zemu and Llonakh, 9-11,000 ft., Nos. 1055, 1739. Frequent.

XXVIII.—DROSERACEÆ.

108. Drosera Linn.

326. **Drosera peltata** Sw.
Lachen, 8-9,000 ft., Nos. 2411, 2749.

XXIX.—HALORAGEÆ

109. Hippuris Linn.

327. Hippuris vulgaris Linn,

Llonakh, 14,500-15,500 ft., Nos. 1886, 2137. Sparingly in the lakes and marshes of the Naku Chu and Ghoraphu Chu. Not recorded previously from Sikkim. Kashmir is the only other locality within the Indian area.

110. Callitriche Linn.

328. Callitriche stagnalis Scop.

Lachen, 8-9,000 ft., No. 2415.

329. Callitriche verna Linn.

Llonakh, 14,500 ft., No. 2225. Not previously found in the East Himalaya.

XXX.—MELASTOMACEÆ.

111. Sarcopyramis Wall.

330. Sarcopyramis nepalensis Wall.

Lachen and Zemu, 7-9,000 ft. Frequent.

XXXI.—ONAGRACEÆ.

112. Epilobium Linn.

331. Epilobium reticulatum Clarke.

Zemu Valley, 10-13,000 ft., Nos. 1142, 1172, 1374, 2730. Frequently among the stones by the river.

332. Epilobium roseum Schreb.

var. **Dalhousieanum.**

Zemu, 10,000 ft., No. 2788.

var. **cylindricum.**

Zemu, 9-10,000 ft., No. 2787.

333. Epilobium origanifolium Lamk.

Zemu, 9-11,000 ft., Nos. 1054, 1111, 1173.

var. **Balansæ.**

Zemu, 12,000 ft., No. 1387.

334. **Epilobium alpinum** Boiss.
Zemu and Llonakh, 12-16,000 ft., Nos. 1249, 1299, 1794, 2068.

335. **Epilobium tetragonum** Linn.
Lachen and Zemu, 8-9,000 ft.

113. Circæa Linn.

336. **Circæa lutetiana** Linn.
Lachen and Zemu, 7-9,000 ft., Nos. 2429, 2752.

337. **Circæa alpina** Linn.
Lachen and Zemu, 8-12,000 ft., Nos. 1115, 1651, 2755.

XXXII.—SAMYDACEÆ.

114. Casearia Jacq.

338. **Casearia** sp.
In fruit only, not matched in Herb. Calc. Lachen 8,000 ft., No. 967.

XXXIII.—CUCURBITACEÆ.

115. Trichosanthes Linn.

339. **Trichosanthes palmata** Roxb.
Tista Valley, 4,500 ft., No. 332.

116. Zehneria Endl.

340. **Zehneria umbellata** Thw.
Cheungtong, 6,000 ft.

117. Thladiantha Bunge.

341. **Thladiantha dubia** Bunge.
Tong, 4,500 ft., No. 855.

XXXIV.—BEGONIACEÆ.

118. Begonia Linn.

342. **Begonia Josephi.** A. D. C.
Lachen, 8,000 ft., No. 2414.

343. **Begonia rubro-venia** Hook.
Tista Valley, 3,000 ft., No. 828.

XXXV.—UMBELLIFERÆ.

119. Hydrocotyle Linn.

344. Hydrocotyle javanica Thunb.
Cheungtong, Lachen, and Lachung, 4-900 ft. Common.

345. Hydrocotyle rotundifolia Roxb.
Cheungtong, 7,000 ft., No. 3083 Ribu.

120. Sanicula Linn.

346. Sanicula europaea Linn.
Lachen and Zemu Valley, 8-10,000 ft., No. 2800. Common.

121. Vicatia DC.

347. Vicatia millefolia Clarke.
Zemu Valley, 12-15,000 ft., Nos. 1377, 1565. Sparingly.

122. Trachydium Lindl.

348. Trachydium novem-jugum Clarke.
Lonakh, 14,000 ft., No. 1785. Sparingly.

349. Trachydium hirsutulum Clarke. ?
Zemu, Llonakh, Thango, and Yumchho La, 13,000-14,500 ft., Nos. 1248, 1449, 2012, etc. Fairly common.

350. Trachydium obtusiusculum Clarke.
Zemu and Llonakh Valleys, 12-14,500 ft., Nos. 1227, 2006. Not uncommon.

123. Bupleurum Linn.

351. Bupleurum Candollii Wall.
Lachen and Zemu, 8-9,000 ft., No. 2799. Frequent.

352. Bupleurum longicaule Wall.
Thango, 13-14,000 ft., No. 2864. Ribu.

124. Pimpinella Linn.

353. Pimpinella bella Clarke.
Zemu Valley, 12,000 ft., No. 2805. Sparingly.

354 Pimpinella Hookeri Clarke.
Zemu and Lachung, 9-10,000 ft., No. 2597. Sparingly.
var. **graminifolia**.
Along with the typical form; No. 2714.

355. **Pimpinella tenera** Benth.

Yumchho La, Zemu, and Llonakh, 10-15,000 ft., Nos. 1119, 1165, 1437, etc. Very common.

356. **Pimpinella diversifolia** DC.

Cheungtong and Lachen, 4-8,000 ft., not common in this area.

125. Chærophyllum Linn.

357. **Chærophyllum villosum** Wall ?

Cheungtong, Lachen, and Zemu, 6-11,000 ft., Nos. 908, 2804. Plentiful near the roads and footpaths. The Sikkim plant is glabrous and seems to me distinct from the West Himalayan and Khasian form, to which the specific name is applicable enough.

126. Œnanthe Linn.

358. **Œnanthe Thomsoni** Clarke.

Common in the damp forest at 4-6,000 ft.

127. Selinum Linn.

359. **Selinum tenuifolium** Wall.

Zemu, 10-12,000 ft., No. 1679. Common.

360. **Selinum papyraceum** Clarke.

Thango, 13,000 ft., No. 2521. Sparingly.

128. Cortia DC.

361. **Cortia Hookeri** Clarke.

Common at 13-17,000 ft., throughout the area. Nos. 1261, 1314, 1475, etc.

129. Pleurospermum Hoffm.

362. **Pleurospermum dentatum** Benth.

Zemu, 10-12,000 ft., No. 1660. Frequent.

363. **Pleurospermum apiolens** Clarke.

Thango, 14,000 ft., No. 2561. Sparingly.

364. **Pleurospermum Hookeri** Clarke.

Zemu, Llonakh, and Thango, 13-16,500 ft., Nos. 1689, 1869, 2057, etc. Very common.

130. Archangelica Hoffm.

365. **Archangelica officinalis** Hoffm.
var. **himalaica.**

Zemu, 10-13,000 ft., No. 1530. Common.

131. **Heracleum** Linn.

366. **Heracleum nubigenum** Clarke.
Yakthang, 13,000 ft., No. 2949 Ribu.

367. **Heracleum Brunonis** Benth.
Thango, 13-14,000 ft., Nos. 2286, 2488, 2539. Common in the Lachen Valley but not seen in the Zemu or Llonakh.

368. **Heracleum sublineare** Clarke.
Zemu and Thango, 12-13,000 ft., No. 1634. Common.

369. **Heracleum obtusifolium** Wall.
Thango, 12-14,000 ft., No. 2288.

370. **Heracleum nepalense** Don.
Common up to 12,000 ft.
var. **bivittata.**
Common.

132. **Caucalis** Linn.

371. **Caucalis Anthriscus** Scop.
Tong and Cheungtong, 5-7,000 ft. Occasional.

XXXVI.—ARALIACEÆ.

133. **Aralia** Linn.

372. **Aralia Pseudo-ginseng** Benth.
Zemu Valley, 8-9,000 ft., No. 2781. Sparingly.

373. **Aralia cissifolia** Griff.
Zemu Valley, 11-13,000 ft., Nos. 1090, 1191. Common.

374. **Aralia cachemirica** Dcne.
Lachen and Zemu, 8-9,000 ft. Nos. 985, 2786. Plentiful.

34. **Pentapanax** Seem.

375. **Pentapanax Leschenaultii** Seem.
Zemu, 8-10,000 ft., Nos. 1010, 1072. Common.

135. **Trevesia** Vis.

376. **Trevesia palmata** Vis.
Cheungtong, 6,000 ft., No. 902. Occasional.

136. **Brassaiopsis** Dcne & Planch.

377. **Brassaiopsis alpina** Clarke.
Zemu, 10-11,000 ft., No. 2782.

378. **Brassaiopsis hispida** Seem.
Cheungtong, 7,000 ft.

XXXVII.—CORNACEÆ.

137. **Marlea** Roxb.

379. **Marlea begoniæfolia** Roxb.
Tista Valley, 1-5,000 ft., No. 806. Very common.

XXXVIII.—CAPRIFOLIACEÆ.

138. **Sambucus** Linn.

380. **Sambucus javanica** Bl.
Tista Valley, 3-6,000 ft. Frequent.

381. **Sambucus adnata** Wall.
Cheungtong and Lachen, 6-7,000 ft., Nos. 904, 2601.

139. **Viburnum** Linn.

382. **Viburnum stellulatum** Wall.
var. **glabrescens.**
Zemu, 10-11,000 ft., No. 2632.

383. **Viburnum cordifolium** Wall.
Zemu, 9-10,000 ft., No. 1074.

384. **Viburnum erubescens** Wall.
Zemu and Llonakh, 8-11,000 ft., Nos. 997, 1069, 1737. Frequent.

140. **Triosteum** Linn.

385. **Triosteum hirsutum** Wall.
Zemu Valley and Thango, 10-13,000 ft., Nos. 1135, 1661.

141. **Lonicera** Linn.

386. **Lonicera macrantha** DC.
Namchi, 4,000 ft., No. 840.

387. **Lonicera acuminata** Wall.
Zemu, 10,000 ft., No. 2633.

388. **Lonicera hispida** Poll.
Zemu, Llonakh, and Thango, 13-15,000 ft., Nos. 1246, 1434, 1161, 2063. Frequent and variable.

389. **Lonicera tomentella** H. f. & T.
Zemu and Thango, 8-13,000 ft., Nos. 1008, 2855 Ribu

390. **Lonicera angustifolia** Wall.
Zemu Valley, 10-15,000 ft., Nos. 1175, 1549.

391. **Lonicera rupicola** H. f. & T.
Above Thango, 14,000 ft., No. 2903 Ribu. A Tibetan plant.

392. **Lonicera spinosa** Jacq.
Llonakh, 15,500 ft., No. 2229. A West Himalayan and Tibetan plant, not previously recorded from Sikkim.

393. **Lonicera parvifolia** Edgew.
Zemu and Llonakh, 14-15,000 ft., Nos. 1327, 1885.
var. **Myrtillus**.
Zemu, 11-13,000 ft., Nos. 1102, 1200, 1226.

394. **Lonicera obovata** Roxb.
Zemu, 13,000 ft., No. 1460.

395. **Lonicera decipiens** H. f. & T.
Zemu, 9-10,000 ft., No. 1046.

142. Leycesteria Wall.

396. **Leycesteria formosa** Wall.
Lachen, 8-9,000 ft., No. 963.

XXXIX—RUBIACEÆ

143. Hymenopogon Wall.

397. **Hymenopogon parasiticus** Wall.
Cheungtong and Lachen, 7-8,000 ft., No. 911.

144. Argostemma Wall.

398. **Argostemma verticillatum** Wall.
Tista Valley, 3,000 ft., No. 802.

145. Anotis DC.

399. **Anotis ingrata** Wall.
Tong, 4-5,000 ft. No. 856.

146. Ophiorrhiza Linn.

400. **Ophiorrhiza Trentleri** Hook. f.
Namchi, 4,000 ft., No. 843.

147. Mussaenda Linn.

401. **Mussaenda Roxburghii** Hook. f.
Tista Valley, 3-4,000 ft., No. 809.

148. Chasalia Comms.

402. Chasalia curviflora Thw.
Tista Valley, 3,000 ft., No. 825.

149 Leptodermis Wall.

403. Leptodermis lanceolata Wall.
Lachung, 9,000 ft., No. 2830.

150. Rubia Linn.

404. Rubia cordifolia Linn.
Lachen and Zemu, 7-10,000 ft., No. 2715. Frequent.

151. Galium Linn.

405. Galium rotundifolium Linn.
Tista Valley, 3-4,000 ft., No. 811. Frequent.
406. Galium triflorum Michx.
Zemu Valley, 8-13,000 ft., No. 1025, 1521.
407. Galium Aparine Linn.
Zemu Valley, 9-10,000 ft., No. 2716.
408. Galium asperifolium Wall.
Cheungtong, Lachen, Zemu, 6-12,000 ft., Nos. 907, 951, 1234.
409. Galium acutum Edgew.
Lachen and Zemu, 8-10,000 ft., No. 2418.

XL.—VALERIANACEÆ.

152. Nardostach DC.

410. Nardostachys Jatamansi DC.
Zemu and Llonakh, 13-17,000 ft., Nos. 1250, 1550, 1959, 2085. Very common.

153. Valeriana Linn.

411. Valeriana Wallichii DC.
Cheungtong, Lachen, Zemu, 6-10,000 ft., Nos. 903, 2820.
412. Valeriana Hardwickii Wall.
Zemu, Thango, 9-15,000 ft. Frequent.

XLI.—DIPSACEÆ.

154. Triplosteg Wall.

413. Triplostegia glandulifera Wall.
Lachen, Zemu, and Thango, 8-14,000 ft., Nos. 1592, 2527, 2551.

155. Morina Linn.

414. Morina longifolia Wall.
Thango, 11-13,000 ft., Nos. 2523, 2753.

415. Morina betonicoides Benth.
Zemu Valley, 11-16,000 ft., Nos. 1089, 1477

156. Dipsacus Linn.

416. Dipsacus inermis Wall.
Cheungtong, Lachen, Zemu, 7-9,000 ft., Nos. 2607, 2751

157. Scabiosa Linn.

417. Scabiosa Hookeri Clarke.
Llonakh, 14-15,000 ft., Nos. 2154, 2737. Frequent.

XLII.—COMPOSITÆ.

158. Eupatorium Linn.

418. Eupatorium cannabinum Linn.
Lachen and Zemu, 7-10,000 ft., No. 2625. Frequent.

159. Myriactis Less.

419. Myriactis nepalensis Less.
Lachen and Zemu, 8-10,000 ft., No. 2626.

160. Aster Linn.

420. Aster diplostephioides Benth.
Llonakh and Thango 14-16,000 ft., Nos. 1788, 1865, 2003, 2061, 2125, 2474. Frequent.

421. Aster sikkimensis H. f. & T.
Yakthang, 13,000 ft., No. 2953 Ribu.

161. Brachyactis Led.

422. Brachyactis menthodora Benth
Thango, 12-13,000 ft., No. 2280.

162. Erigeron Linn.

423. Erigeron multiradiatus Benth.
Zemu, Llonakh, Thango, 12-14,000 ft., Very common.

163. Microglossa DC.

424. Microglossa albescens Clarke.
Lachen and Zemu, 8-9,000 ft., No 2624. Frequent.

164. Antennaria Gaertn.

425. **Antennaria muscoides** H. f. & T.
Llonakh, Giagong, 14,500-1,700 ft., Nos. 1836, 2206, 2443, 2447. Not seen in the moister Zemu Valley.

165. Leontopodium Br.

426. **Leontopodium alpinum** Cass
Zemu, Llonakh, Thango, 14-17,000 ft. Very common and very variable.
var. **Stracheyi** Hook. f.
Above Lachen, No. 2984 Ribu.

427. **Leontopodium fimbrilligerum** J. R. Drummond.
Llonakh, 15,500 ft., No. 2231.

166. Anaphalis DC.

428. **Anaphalis nubigena** DC.
Zemu Valley and Llonakh, 12-17,000 ft. Common.
var. **intermedia** Hook f.
With the type.

429. **Anaphalis Royleana** DC.
Zemu, Llonakh, Thango, 12-14,000 ft. Frequent.
var. **concolor** Hook f.
Thango, 13-14,000 ft., Nos. 2490, 2516.

430. **Anaphalis triplinervis** Clarke.
Lachen, 7,000 ft., No. 929.

431. **Anaphalis xylorhiza** Schultz-Bip.
Nachegoh, Llonakh, Kangralamo, 14-16,000 ft., Nos. 713, 1873, 2074, 2132, 2143. Common in Llonakh. Sparingly elsewhere.

432. **Anaphalis araneosa** DC.
Below Thango, 11,000 ft., No. 2522.

167. Inula Linn.

433. **Inula Hookeri** Clarke.
Zemu Valley, 9-10,000 ft., No. 2404.

168. Carpesium Linn.

434. **Carpesium cernuum** Linn.
Zemu Valley, 8-13,000 ft. Common.

435. **Carpesium abrotanoides** Linn.
Cheungtong, 7,000 ft., No. 2606.

169. Adenocaulon Hook.

436. Adenocaulon bicolor Hook.
Lachen and Zemu, 8-9,000 ft., No. 2434.

170. Allardia Dcne.

437. Allardia glabra Dcne.
Upper Llonakh valleys, 14,500-16,000 ft., Nos. 1964, 2202, 2247, 2301.

171. Tanacetum Linn.

438. Tanacetum nubigenum Wall.
Llonakh, Thango, 13-15,000 ft., Nos. 2546, 2820 Ribu.

439. Tanacetum gossypinum H. f. & T.
Upper Llonakh valleys, 14,500-17,000 ft., Nos. 1801, 2029, 2190, 2245.

172. Artemisia Linn.

440. Artemisia salsoloides Willd.
Llonakh, 15-16,500 ft., Nos. 2139, 2177. A west Tibetan and Siberian plant.

441. Artemisia parviflora Roxb.
Lachen and Lachung, 7-10,000 ft. Frequent.

442. Artemisia stricta Edgew. ?
Llonakh, 15,000 ft., No. 2116.

443. Artemisia biennis Willd.
Giagong, 15,000 ft., No. 2469.

444. Artemisia vulgaris Linn.
Tista Valley and Lachen, 4-8,000 ft. Frequent.

445. Artemisia Campbellii H. f. & T.
Llonakh, Thango, 14-17,000 ft., Nos. 1916, 1936, 2156, 2470.

446. Artemisia Moorcroftiana Wall. ?
Llonakh, 15,000 ft., No. 2759 Ribu.

There remain one or two *Artemisias* which I have failed to identify definitely.

173. Cremanthodium Benth.

447. Cremanthodium Decaisnei Clarke.

Llonakh, 15-16,000 ft., Nos. 1939, 1974, 2264, 2352. Frequent. The large leaved glabrous *C. reniforme* Bth. was not observed in any of the valleys.

448. **Cremanthodium Thomsoni** Clarke.
Zemu and Llonakh, 12-15,000 ft., Nos. 1301, 1605, 1616, 1753, 1782. Frequent.

449. **Cremanthodium cuculliferum** W. W. Smith, sp. nov.

Species *C. discoidei* Maxim. valde affinis.

Cauliculus ad 15 cm. longus, sinuosus, 1—2-foliatus, capillis albis nigrisque intermixtis superne indutus, inferne glabrior. *Folia radicalia* (3-5) ad 4 cm. longa, ovato-oblonga, sinuata, obtusa, glabra, chartacea, rugosa; petiolus 2-3 cm. longus, interdum late dilatatus, interdum augustior, revolutus. *Folia caulina* 1-2, minora, erecta, lineari-oblonga, obtusa basi vaginante amplexicaulia, inferius glabrius, superius interdum nigro-villosissimum bracteiforme capitulo proximum. *Capitulum* 2-2·5 cm. diametiens, involucro segmentis acutis nigro-villosissimo, ligulis nullis, pappo albo.

Naku La, Llonakh, 17,500 ft., No. 1956.

Very near Przewalski's plant of *C. discoideum* Maxim. found in the province of Kansu in Western China; but not matching it as represented in Kew or in Calcutta Herbaria.

450. **Cremanthodium palmatum** Benth.
Zemu, Llonakh and Thango, 12-14,000 ft., Nos. 1619, 1691, 1771, 2081, 2501. Not uncommon.

451. **Cremanthodium oblongatum** Clarke.
Zemu and Llonakh, 12-16,000 ft., Nos. 1393, 1496, 1705, 2213. Not uncommon.

452. **Cremanthodium** sp.
Chhortenima Valley, Llonakh, 16,500 ft., No. 2303.

174. **Doronicum** Linn.

453. **Doronicum Hookeri** Clarke.
Tumrachen Valley and Thango, 12-14,000 ft., Nos., 1696, 2289.

175. **Gynura** Cass.

454. **Gynura angulosa** DC.
Tong, 5,000 ft., No. 884.

176. **Senecis** Linn.

455. **Senecio graciliflorus** DC.
Zemu, 10-12,000 ft., No. 1664.

456. **Senecio bracteolatus** Hook. f.
Zemu Valley, Naku Chu, Llonakh, 13-17,500 ft., Nos. 1408, 1952.

457. **Senecio diversifolius** Wall.
Zemu Valley, 9-11,000 ft., Nos. 1071, 1704, 2402.

458. **Senecio Ligularia** Hook. f.
Lachen and Zemu, 8-10,000 ft., Nos. 1002, 2432.

459. **Senecio retusus** Wall.
Zemu, Llonakh, Thango, 11-15,000 ft., Nos. 1106, 1703, 1765, 2384. Frequent.

460. **Senecio calthæfolius** Hook. f. ?
Zemu, 14,000 ft., No. 1347.

461. **Senecio scandens** Don.
Above Lachen, 9-10,000 ft.

462. **Senecio alatus** Wall.
Zemu and Llonakh, 9-11,000 ft. Frequent.

463. **Senecio quinquelobus** Hook. f. & T.
Zemu and Thango, 9-12,000 ft., Nos. 1584, 2405.

464. **Senecio acuminatus** Wall.
Zemu, 8-10,000 ft., Nos. 2403, 2622.

177. Cnicus Linn.

465. **Cnicus eriophoroides** Hook. f.
Zemu Valley, 9-10,000 ft., No. 1037.

466. **Cnicus Wallichii** DC.
Lachen and Zemu, 8-9,000 ft., No. 2431.

178. Saussurea DC.

467. **Saussurea obvallata** Wall.
Zemu, Llonakh, Thango, 12-16,000 ft., Nos. 1332, 1683. Frequent.

468. **Saussurea uniflora** Wall.
Zemu and Llonakh, 11-14,000 ft., Nos. 1327, 2069. Frequent.

469. **Saussurea wernerioides** Schultz-Bip.
Upper Valleys of Llonakh, 15,500-16,500 ft., Nos. 2219, 2322.

470. **Saussurea** sp.

Species *Saussureæ subulatæ* Clarke affinis, forsan varietas, sed bracteis flaccidis et hirsutis distincta. *S. subulatæ* omnes typi in Herb. Calc. bracteas rigidas glabrasque habent.

Llonakh, 15-17,000 ft., Nos. 1951, 2140, 2315.

471. Saussurea Sughoo Clarke.

Very common throughout Llonakh and very variable. Also abundant at Giagong and Kangralamo, 14-16,000 ft., Nos. 1706, 1786, 2028, 2149, 2342, 2442. I make out about half a dozen forms which run into one another.

472. Saussurea Yakla Clarke.

Llonakh, 15,000 ft., No. 2367.

473. Saussurea taraxicifolia Wall.

var. **depressa** Hook. f.

Thango, 13-14,000 ft., No. 2499.

474. Saussurea Kunthiana Clarke.

Zemu, Llonakh, Thango, 13-17,000 ft., Nos. 1573, 1884, 1932, 2268. Frequent.

var. **major** Hook. f.

Above Thango, 13-14,000 ft., No. 2541.

475. Saussurea polystichoides Hook. f.

Llonakh and Thango, 14-15,000 ft., Nos. 1499, 2485.

476. Saussurea Stella Maxim.

Upper Valleys of Llonakh, 15,500-16,000 ft., Nos. 1894, 2215. A Tibetan plant, not previously recorded from Sikkim.

477. Saussurea Andersoni Clarke.

Zemu, Llonakh, Thango, 12-14,500 ft., Nos. 1336, 1707, 2483.

478. Saussurea Hookeri Clarke.

Llonakh, 14,500-17,000 ft., Nos. 2162, 2224, 2320, 2343.

479. Saussurea hieracoides Hook. f.

Thango, 14,000 ft., No. 2385.

480. Saussurea Candolleana Wall.

Zemu, 11-12,000 ft., No. 1666.

481. Saussurea hypoleuca Spreng.

Zemu, 10-11,000 ft., No. 1732.

482. Saussurea deltoidea Clarke.

Lachen, 7-9,000 ft.

483. Saussurea denticulata Wall.

Lachen and Zemu, 8-11,000 ft., Nos. 1658, 2425.

484. Saussurea gossypiphora Don.

Zemu, Llonakh and Thango, 14-17,000 ft., Nos. 133[illegible], 1427, 1498, 2191. Frequent.

485. Saussurea sacra Edgew.

Llonakh, 16,000 ft., No. 1500.

486. **Saussurea tridactyla** Schultz-Bip.
Llonakh, 17,000 ft., Nos. 2193, 2337.

487. **Saussurea tanguensis** J. R. Drummond.

The La, Jongsong La Valley, Llonakh, 15,000-16,000 ft., Nos. 2161, 2357. A very peculiar plant with bright red pappus.

179. **Gerbera** Gronov.

488. **Gerbera Kunzeana** Br. & Asch.
Below Thango, 13,000 ft., No. 2940 Ribu.

180. **Picris** Linn.

489. **Picris hieracioides** Linn.
Cheungtong, Lachen and Zemu, 7-9,000 ft., Nos. 2605, 2627.

181. **Crepis** Linn.

490. **Crepis fuscipappa** Benth.
Lachen, Zemu, 8-10,000 ft., Nos. 981, 2628.

491. **Crepis gracilipes** Hook. f.
Llonakh and Giagong, 15-16,000 ft., Nos. 1892, 1982, 2454.

492. **Crepis depressa** H. f. & T.
Llonakh, 16,000 ft., No. 2711 Ribu.

493. **Crepis glomerata** Dcne.
Zemu, Llonakh, Thango, 13-16,000 ft. Frequent.

182. **Taraxacum** Hall.

494. **Taraxacum officinale** Wigg.
var. **parvula** Hook. f.
Llonakh, 14-17,000 ft., Nos. 1835, 1891, 2060, 2621.

183. **Lactuca** Linn.

495. **Lactuca graciliflora** DC.
Lachen, 8-10,000 ft.

496. **Lactuca hastata** DC.
Below Thango, 11,000 ft., No. 2524.

497. **Lactuca macrorhiza** Hook. f.
Lachen, Lachung, 9-10,000 ft., Nos. 2300, 2526.

498. **Lactuca Lessertiana** Clarke.
Llonakh, Giagong, 14-15,000 ft., Nos. 1791, 2460.

499. **Lactuca macrantha** Clarke.
Zemu, Thango, 12-14,000 ft., Nos. 1652, 2475.

500. **Lactuca bracteata** H. f. & T.
Lachen, 8-10,000 ft., No. 2433.

501. **Lactuca Dubyæa** Clarke.
Llonakh, Thango, 12-13,000 ft., Nos. 1763, 2283, 2295.

184. **Sonchus** Linn.

502. **Sonchus arvensis** Linn.
Tong, 4-5,000 ft., No. 871.

XLIII.—CAMPANULACEÆ.

185. **Leptocodon** H. f. & T.

503. **Leptocodon gracilis** H. f. & T.
Tong, Cheungtong, 5-7,000 ft., No. 849.

186. **Codonopsis** Wall.

504. **Codonopsis affinis** H. f. & T.
Lachen, 10,000 ft., No. 2372.

505. **Codonopsis Benthami** H. f. & T.
Lachen & Zemu, 8-10,000 ft., Nos. 975, 986.

506. **Codonopsis subsimplex** H. f. & T.
Zemu, 13,000 ft., No. 1653.

507. **Codonopsis thalictrifolia** Wall.
Zemu, Llonakh, 12-14,500 ft., Nos. 1670, 1759, 2124.

508. **Codonopsis fœtens** H. f. & T.
Yumchhe La, Tumrachen, Zemu, Llonakh, 13-14,500 ft., Nos. 1298, 1603, 1762, 1784.

187. **Cyananthus** Wall.

509. **Cyananthus pedunculatus** Clarke.
Llonakh, Thango, 13-15,000 ft., Nos. 2005, 2266, 2533. Frequent.

510. **Cyananthus incanus** H. f. & T.
Llonakh, Thango, 14-16,000 ft., Nos. 1860, 2076, 2141, etc. Frequent. Not seen in the Zemu Valley. *C. inflatus* H. f. & T. common in Sikkim was not found either in Zemu or Llonakh.

188. **Campanula** Linn.

511. **Campanula colorata** Wall.
Tong, Lachen, Zemu, 5-9,000 ft. Common.

512. **Campanula aristata** Wall.

Zemu, Llonakh, Thango, 13-15,000 ft., Nos. 1238, 1458, 1628, etc. Frequent.

513. **Campanula modesta** H. f. & T.

Zemu, Llonakh, 14-17,000 ft., Nos. 1357, 1375, 1781, 2331, 2353.

XLIV.—VACCINIACEÆ.

189. Vaccinium Linn.

514. **Vaccinium sikkimense** Clarke.

Zemu Valley, 12,000 ft., No 1596.

515. **Vaccinium serratum** Wight.

Tong, 5,000 ft., No. 885.

516. **Vaccinium glauco-album** Hook. f.

Zemu, 8-9,000 ft., No. 989.

XLV.—ERICACEÆ.

190. Gaultheria Linn.

517. **Gaultheria nummularioides** Don.

Lachen, Zemu Valley, and Lower Llonakh, 7-12,000 ft., No. 936. Frequent.

518. **Gaultheria trichophylla** Royle.

Yumchho La, Zemu and Thango, 11-15,000 ft., Nos. 1225, 1325, 2517. Very common.

519. **Gaultheria pyrolæfolia** Hook. f.

Zemu Valley and Thango, 12,500-14,500 ft., Nos. 1130, 1369, 2509. Generally distributed but not common.

520. **Gaultheria fragrantissima** Wall.

Lachen, Zemu Valley and Lachung, 7,000-9,000 ft., Nos. 970, 991, 2578. Common.

521. **Gaultheria Hookeri** Clarke.

Lachen and Zemu Valley, 8-9,000 ft., No. 1026. Occasional

191. Cassiope D. Don.

522. **Cassiope fastigiata** D.Don

Zemu Valley, 11-15,000 ft., Nos. 1114, 1123. Common.

523. **Cassiope selaginoides** H. f. & T.

Zemu Valley, 11-15,000 ft., Nos. 1124, 1368. Much more sparingly than the preceding. Both are found up to and along the sides of the Zemu glacier.

192. Pieris D. Don.

524. **Pieris ovalifolia** D. Don.
Lachen, Zemu and Lachung, 7-10,000 ft., Nos. 2718, 2719. Common.

525. **Pieris villosa** Hook. f.
Lachen, 9,000 ft. Sparingly.

526. **Pieris formosa** Don.
Lachen and Zemu, 8-10,000 ft., Nos. 962, 2720. Frequent.

193. Enkianthus Lour.

527. **Enkianthus himalaicus** H. f. & T.
Lachen, Zemu Valley, and Lachung, 8-10,000 ft., Nos. 1016, 1062, 2592. Not uncommon.

194. Diplarche H. f. & T.

528. **Diplarche multiflora** H. f. & T.
Zemu Valley and Yumchho La, 12-15,000 ft., No. 1272.

529. **Diplarche pauciflora** H. f. & T.
Zemu Valley, 14-15,000 ft., Nos. 1363, 1539. Both species extend up to and along the sides of the Zemu glacier and form a conspicuous feature of the sparse vegetation beside the melting snow on the surrounding slopes.

195. Rhododendron Linn.

530. **Rhododendron vaccinioides** Hook. f.
Lachen, 8,000 ft., No. 948.

531. **Rhododendron grande** Wight.
Lachen.

532. **Rhododendron Hodgsoni** Hook. f.
Very common above Lachen and in Lower Zemu Valley, forming the chief constituent of the Rhododendron " jungle " from 9-11,000 ft.

533. **Rhododendron Falconeri** Hook. f.
Frequent, especially above Lachen.

534. **Rhododendron arboreum** Sm.
Zemu Valley 8-10,000 ft., No. 2780.

535. **Rhododendron campanulatum** Don.
Zemu Valley and Yumchho La, 11-14,000 ft., Nos. 1204, 1304, 1252. Very common and along with *R. Wightii* forms dense 'jungle' on the slopes of the higher valleys.

536. **Rhododendron Wightii** Hook. f.
Zemu. Very common.

537. **Rhododendron campylocarpum** Hook. f.
Zemu, 11,500-15,000 ft., Nos. 1235, 1431, 1677. Common.

538. **Rhododendron Thomsoni** Hook. f.
Zemu, 9-10,000 ft., No. 1043.

539. **Rhododendron barbatum** Wall.
Above Lachen.

540. **Rhododendron ciliatum** Hook. f.
Zemu, 9,000 ft., No. 2778.

541. **Rhododendron camelliæflorum** Hook. f.
Zemu and Lachung, 9-10,000 ft., Nos. 2591, 2779.

542. **Rhododendron pumilum** Hook. f.
Yumchho La and Upper Zemu, 14-15,000 ft., Nos. 1309, 1598. This Rhododendron is very sparingly distributed in Sikkim and has been recorded only two or three times since Hooker's explorations. It occurs here and there on the south side of the Zemu valley on open rocky slopes where the more prevalent species begin to thin off.

543. **Rhododendron lepidotum** Wall.
Very common and along with *R. Anthopogon* forming the highest belt of Rhododendrons at 14-16,000 ft.

544. **Rhododendron Anthopogon** D. Don.
Very common.

545. **Rhododendron Maddeni** Hook. f.
Tong, 5,000 ft., No. 881.

546. **Rhododendron cinnabarinum** Hook. f.
Zemu and Lachung, 10-12,000 ft., Nos. 1177, 1633, 2619.

547. **Rhododendron** sp. in fruit.
near **R. Dalhousiæ** Hook. f. Doubtful; Zemu, 11,400 ft., No. 1097.

196. **Pyrola** Linn.

548. **Pyrola rotundifolia** Linn.
var. **asarifolia.**
Lachen, 8-9,000 ft., No. 966.

XLVI.—MONOTROPACEÆ.

197. **Monotropa** Linn.

549. **Monotropa uniflora** Linn.
Lachen and Zemu, 8-9,000 ft., No. 2759.

XLVII.—DIAPENSIACEÆ.

198. Diapensia Linn.

550. Diapensia himalaica H. f. & T.

Zemu and Yumchho La., 14-16,500 ft., Nos. 1276, 1361, 1540. Extends sparingly along the slopes above the Zemu glacier.

XLVIII.—PRIMULACEÆ.

199. Primula Linn.

551. Primula reticulata Wall.

Zemu Valley, 12-15,000 ft., Nos. 1128, 1429, 1502.

552. Primula denticulata Wall.

Lachen and Lower Llonakh, 8-11,000 ft.

553. Primula atrodentata W. W. Smith, sp. nov.

P. Schlagintweitianæ Pax, affinis sed bracteis lineari-lanceolatis longe-acuminatis, floribus minoribus diversa.

Minor, gracilis, efarinosa, pubescens. *Rhizoma* esquamosum, vetustis foliis nigris flaccidis indutum. *Folia* cum floribus nascentia, ad 2 cm. longa, 1 cm. lata, angusto-spathulata, obtusa, in petiolum brevissimum contracta, argute denticulata, minutissime puberula. *Scapus* folia longe superans, 6-8 cm. altus, capitulum densum gerens; *bracteæ* 5 mm. longæ, lineari-lanceolatæ, longe-acuminatæ, non-gibbosæ, nigricantes; pedicelli fere nulli. *Flores* erecti. *Calycis* 4-5 mm. longi tubus breviter campanulatus, ad medium fissus; lobi lineari-lanceolati, acuminati, nigrescentes. *Corollæ* lilacinæ tubus calycem duplo superans, gracilis; lobi obcordati emarginati.

Zemu and Llonakh, 14,500-16,000 ft., Nos. 1478, 1812, 2007. Perhaps the East Himalayan form of *P. Schlagintweitiana* Pax. It matches a somewhat incomplete specimen in Herb. Kew, collected by Hooker in Lachen, 13,000 ft., not named.

554. Primula capitata Hook.

Throughout the Zemu and Llonakh valleys, 12-15,000 ft., Nos. 1088, 1355, 1625, 2059. Frequent and variable.

555. Primula bellidifolia King.

Zemu, Llonakh, 13-14,500 ft., Nos. 1624, 2058. Rare.

556. Primula concinna Watt.

Zemu, Llonakh, 15-16,000 ft., Nos. 1263, 1718, 2022.

557. Primula glabra Klatt.

Yumchho La, 15,000 ft., No. 1315.

558. Primula involucrata Wall.

Zemu, Llonakh, 13-14,000 ft., Nos. 1609, 2079.

559. Primula tibetica Watt.

Llonakh, 14-15,000 ft., Nos. 1851, 2087.

560. Primula Caveana W. W. Smith, sp. nov.

Species ad sectionem *Callianthanum* Pax, pertinens, *Primulæ hazaricae* et *P. Jaffreyanæ* affinis; longis petiolis, pedicellis glandulosis, calyce farinoso fere ad imum fisso distincta.

Minute pubescens. *Rhizoma* permultis vetustis foliis persistentibus indutum. *Folia viridia* 4-8, obovata vel suborbicularia, obtusa, denticulata, membranacea, subtus albo-farinosa; lamina ad 4 cm. longa, ad 1·5 cm. lata sensim attenuata in petiolum alatum 3-6 cm. longum basi late vaginantem. *Scapus* folia paullo tantum excedens, 5-8 cm. altus, 2-4 flores gerens. *Bracteæ* lineares 7-8 mm. glanduloso-pubescentes; pedicelli 1-1·5 cm. longi, graciles. *Calycis* 5-8 mm. longi tubus anguste campanulatus, ultra medium fissus; lobi lineari-lanceolati, acuti, pubescentes, dense farinosi. *Corollæ* pallide purpureæ tubus calycem 2-3-plo superans, 1·5-1·8 cm. diametiens; lobi obcordati, integri vel breviter erosi. *Capsula* calyce inclusa, globosa.

Among rocks and boulders in the upper Llonakh valley, Sikkim, 15,000 ft., Nos. 1810, 2111. Very near *Primula Jaffreyana* King, which however is glabrous, much less farinose and with calyx distinctly ribbed. The previous season's leaves and fruits are remarkably persistent, probably protected by the snow which lasts for nearly nine months in this region.

561. Primula obtusifolia Royle.

Yumchho La, Zemu, 12-16,500 ft., Nos. 1236, 1345, 1554, 1555, 1587. Frequent.

562. Primula elongata Watt.

Zemu, 14-15,000 ft., Nos. 1430, 1519, 1531, 1532.

563. Primula nivalis Pall.

var. **macrophylla.**

Upper valleys of Llonakh, 15-16,000 ft., Nos. 2160, 2195, 2196, 2338.

var. **macrocarpa.**

Thango, 14,000 ft., No. 2494.

564. Primula sikkimensis Hook. f.

Zemu and Llonakh, 11-15,000 ft., Nos. 1094, 1289, 1389, 1614. Frequent.

567. **Primula Dickieana** Watt.

South of Yumchho La, 13-14,000 ft., Nos. 1305, 1311, 1604, 1610. Common in this locality, not seen elsewhere.

var. **Pantlingii** (King sp.)

With the type and not separable except by number of flowers in the umbel.

568. **Primula pusilla** Wall.

Zemu and Llonakh, 12-16,000 ft., Nos. 1257, 1302, 1423. Frequent.

569. **Primula sapphirina** H. f. & T.

Zemu and Llonakh, 14-16,000 ft., Nos. 1294, 1314, 1418, 2275.

570. **Primula uniflora** Klatt.

North and South sides of Yumchho La, 14-15,000 ft., Nos. 1297, 1313, 1446, 1599.

571. **Primula petiolaris** Wall.

Zemu, 13,000 ft., No. 1682.

572. **Primula flagellaris** W. W. Smith, sp. nov.

Ab omnibus *Primulis* adhuc cognitis facile distincta prælongis nudis stolonibus. Ad sectionem *Minutissimarum* Pax spectat; *Tenellarum* sectioni tamen propinqua.

Parva, stolonifera; stolones ad 10 cm. longi, flagelliformes, omnino nudi, *Saxifragæ flagellaris* more; in omnibus speciebus *Minutissimarum* stolones abbreviati foliosi sunt, ut cl. Pax monstrat (Monogr. Primulacearum, Das Pflanzenreich, p. 95). *Folia* parva, 1-2 cm. longa, 4-8 mm. lata, sensim in brevem petiolum 2-6 mm. contracta, lanceolata vel obovata, subacuta vel apice subrotundata, basi cuneata, subtus albo-farinosa, pro magnitudine grosse argute dentata. *Scapus* brevis ad 6 mm. longus, gracilis, inter folia fere occultus, uniflorus; bractea linearis 1 mm. longa, infra calycem 2-3 mm. inserta. *Calycis* 3 mm. longi tubus campanulatus, puberulus, fere ad imum fissus; lobi lineari-oblongi, obtusi. *Corollæ* purpureæ tubus calycem multo superans, gracilis, 8-9 mm. longus; limbus 1 cm. diametiens; lobi obcordati, emarginati. *Capsula* ovoidea calycem aequans; semina non visa.

At 12,000 ft., on hill near mouth of Zemu Valley, in the direction of Lachen, No. 2631. Very sparingly. A very distinct plant with long runners terminating in small plants after the fashion of *Androsace geraniifolia* and the flagellate Saxifrages.

573. **Primula Hookeri** Watt.

Yumchho La, 14-15,000 ft.

574. Primula sp. aff. **Hookeri.**

Yumchho La, 15,000 ft., No. 1528.

The calyx-lobes are denticulate but the plant agrees very closely with P. Hookeri and is probably not distinct.

575. Primula muscoides Hook. f.

Zemu and Llonakh, 14-16,000 ft., Nos. 1316, 1508, 1522, 2260, 2512.

576. Primula tenuiloba (Hook. f.) Pax.

Folia breviter petiolata. *Flores* ad 4 mm. pedicellati. *Corollæ* tubus extus molliter hirsutus.

This does not quite agree with the type of *Primula tenuiloba* at Kew but is too near to be considered distinct. Yumchho La, Nachegoh, and Nangma La, 15,500-16,500 ft., Nos. 1317, 1509, 1717, 2272. Near the summit of bleak passes, very plentiful at Nangma La. Not a common plant in Sikkim but of wide distribution, occurring in much the same habitats as *Primula muscoides.*

200. Androsace. Linn.

577. Androsace geraniifolia Watt.

Lachen, 8-9,000 ft., No. 979.

578. Androsace strigillosa Franch.

Thango, 13-14,000 ft., Nos. 2375, 2491, 2555.

579. Androsace Hookeriana Klatt.

Yumchho La, Zemu, Thango, 13-16,000 ft., Nos. 1334, 1484, 1698, 2487, 2511.

580. Androsace Chamæjasme Host.

var. **coronata** Hook. f.

Upper valleys of Llonakh, 15-16,500 ft, Nos. 2198, 2310. Not previously found in the Eastern Himalayas.

581. Androsace Selago H. f. & T.

Zemu, Llonakh, 14,500-17,000 ft., Nos. 1487, 1805. Frequent.

582. Androsace Poissonii Kunth.

Upper Valleys of Llonakh, 15,500-16,000 ft., Nos. 1966, 2204.

583. Androsace Lehmannii Duby.

Zemu Valley, 12-16,000 ft., Nos. 1335, 1567, 1622.

201. Bryocarpum. H. f. & T.

584. Bryocarpum himalaicum H. f. & T.

Lachen and Zemu, 8-10,000 ft., No. 1063.

202. Lysimachia Linn.

585. Lysimachia chenopodioides Watt.

Lachung, 8-9,000 ft., No. 2789. Not previously found in Sikkim.

586. Lysimachia alternifolia Wall.

Tong, 5,000 ft., No. 867.

587. Lysimachia japonica Thunb.

Tong, Lachen, 4-8,000 ft., Nos. 860, 2630.

203. Glaux Tournef.

588. Glaux maritima Linn.

Llonakh, 14,500 ft., No. 1919. New to the East Himalaya.

XLIX.—MYRSINACEÆ.

204. Mæsa Forsk.

589. Mæsa rugosa Clarke.

Cheungtong, 5-6,000 ft., No. 894.

205. Ardisia Swartz.

590. Ardisia humilis Vahl.

Namchi, 4,000 ft., No. 841.

L.—OLEACEÆ.

206. Jasminum Linn.

591. Jasminum humile Linn.

Lachen, 8,000 ft, No. 2790.

LI.—ASCLEPIADACEÆ.

207. Cynanchum Linn.

592. Cynanchum Vincetoxicum Pers.

Zemu Valley, Lachen and Lachung, 7-10,000 ft., Nos. 2589, 2732, 2744.

593. Cynanchum auriculatum Royle.

Zemu Valley, 9,000 ft., No. 2740.

208. Tylophora Br

594. Tylophora tenerrim Wight.

Tong, 5,000 ft., No. 889.

209. **Hoya** Br.

595. Hoya Edeni King.
Tong, 5,000 ft., No. 891.
596. Hoya longifolia Wall.
Namchi, 4,000 ft., No. 846.

210. **Ceropegia** Linn.

597. Ceropegia pubescens Wall.
Cheungtong, 6,000 ft., No. 923.
598. Ceropegia Hookeri Clarke.
Zemu, 9,000 ft., No. 2822.
599. Ceropegia macrantha Wight.
Tong, 5,000 ft., No. 868.

LII.—LOGANIACEÆ.

211. **Buddleia** Linn.

600. Buddleia Colvillei Hook. f.
Zemu and Lachen, 9,000 ft., No. 2739.
601. Buddleia macrostachya Benth.
Lachen, 8-9,000 ft.

LIII.—GENTIANACEÆ.

212. **Crawfurdia** Wall

602. Crawfurdia affinis Wall.
Lachen, 7,000 ft., No. 944.

213. **Gentiana** Linn.

603. Gentiana Thomsoni Clarke.
Llonakh, 16,000 ft., No. 2234.
604. Gentiana tenella Fries.
var. **sikkimensis** Clarke.

Yumchho La, Zemu, Llonakh, and Thango, 13-16,000 ft., Nos. 1450, 1543, 1588, 1669, 1796, 2484. Frequent.

605. Gentiana sp. aff. **G. tenella** Fries.
Llonakh, No. 2760, Ribu.
606. Gentiana bryoides Burkill.
Zemu, 11-12,000 ft., No. 1096.

607. Gentiana crassuloides Bur. & Franch.

Zemu, Llonakh, and Thango, 13-15,000 ft., Nos. 1286, 1591, 2401, 2723.

608. Gentiana infelix Clarke.

Yumchho La, Zemu, Llonakh, 14-15,000 ft., Nos. 1274, 1288, 1525, 2275.

609. Gentiana micans Clarke.

Naku La, Llonakh, 15,000 ft., No. 2745 Ribu.

610. Gentiana Elwesii Clarke.

Llonakh, and Nangma La, 14-15,000 ft., Nos. 1792, 2277.

611. Gentiana amœna Clarke.

Thé La, Naku La, Llonakh 15-17,000 ft., Nos. 1928, 2174, 2308, 2323.

612. Gentiana phyllocalyx Clarke.

Yumchho La, Zemu, Thango, 13-16,000 ft., Nos. 1129, 1271, 1349, 1565, 2503. Abundant in the Upper Zemu.

613. Gentiana tubiflora Wall.

Zemu and Llonakh, 15-16,000 ft., Nos. 1728, 1978, 2171, 2271.

614. Gentiana ornata Wall.

Llonakh, 15-16,000 ft., No. 2307.

var. **meiantha** Clarke ?

Giagong, 15,000 ft., No. 2463.

615. Gentiana nubigena Edgew.

Jongsong La Valley, Llonakh, 16,500 ft., No. 2319.

616. Gentiana robusta King.

Llonakh, Thango, 14-16,000 ft., Nos. 2135, 2856 Ribu.

617. Gentiana detonsa Fries.

var. **Stracheyi** Clarke.

Zemu, Llonakh, Thango, 13-14,000 ft., Nos. 1697, 2064, 2569.

214. Parajæschkea Burkill. Genus novum.

Herba annua diffusa. *Sepala* libera. *Corollæ* tubus infundibuliformis; lobi lati, conspicue contorti. *Staminum* filamenta perbrevia, inter corollæ lobos inserta; pollen sphæroideo-tetrahedroideum. *Stylus* brevis: placentæ inconspicuæ: semina (matura non visa) læviora.

Genus novum ex affinitate *Gentianæ*: differt staminum insertione. Cum *Jæschkea* habitu corollæque lobis non quadrat; cum *Latouchea* calyci ovarioque non quadrat.

618. Parajæschkea Smithii Burkill, sp. nov.

Planta annua, omnino glabra. *Radix* singula. *Caules* plures, diffusi, quadrangulares ad 6 cm. alti, sat foliosi. *Folia* oblan-

ceolato-ovata vel obovata, sessilia, vix subamplexicaulia, crassiuscula, ad 6 mm. longa, ad 3-5 mm. lata, apice obtusissima vel rotundata, marginibus in angulas caulinas decurrentibus. *Flores* in apicibus internodiorum ad 7 mm. longorum producti, pallide cœrulei. *Sepala* 5, libera, exteriora obovato-oblanceolata obtusiuscula, interiora duo oblanceolata acutiuscula, 6 mm. longa, 2-2·5 mm. lata, trinervia. *Corollæ* tubus ad 4 mm. longus, basi decem glandulis notatus, filamentorum cruribus adnatis percursus, lobi 5; contorti, cuspidato-rotundati, margine minutissime serrulato et enim apicem versus aliquomodo undulato, 2 mm. longi. *Stamina* 5, filamentorum partes liberæ vix 1 mm. longæ; antheræ dorsifixæ: pollen sphæroideo-tetrahedroideum. *Ovarium* elongatum, ad 6 mm. longum: stylus 1 mm. longus: placentæ inconspicuissimæ. *Semina* ovoidea, læviora.

Llonakh, 15,000 ft., No. 2133.

215. **Pleurogyne** Eschsch.

619. Pleurogyne sikkimensis Burkill.
Naku La, Llonakh, 15-16,000 ft., No. 2774 Ribu.

620. Pleurogyne lloydioides Burkill.
Thango, 14,000 ft., No. 2482.

620b. Pleurogyne aff. **P. Thomsoni** Clarke.
Naku La, 15,000 ft., No. 2763 Ribu.

216. **Swertia** Linn.

621. Swertia dilatata Clarke.
Cheungtong, 6,000 ft., No. 2610.

622. Swertia Hookeri Clarke.
Zemu Valley, 11-14,000 ft., Nos. 1220, 1623.

623. Swertia cuneata Wall.
Below Giagong, 14,000 ft., No. 2879 Ribu.

624. Swertia multicaulis Don.
Zemu, Llonakh, and Thango, 14-17,000 ft., Nos. 1310, 1425, 2725. Frequent.

217. **Halenia** Borckh..

625. Halenia elliptica Don.
Lachen and Zemu, 7-10,000 ft., Nos. 2406, 2722. Common.

LIV.—BORAGINACEÆ.

218. **Cynoglossum** Linn.

626. Cynoglossum furcatum Wall.
Tista Valley up to Lachen, 3-8,000ft.. No. 808.

627. Cynoglossum denticulatum DC.

Lachen, Zemu, 8-12,000 ft., Nos. 1001, 1093, 1154.

219. Paracaryum Boiss.

628. Paracaryum glochidiatum Benth.

Zemu; 8-12,000 ft., Nos. 1022, 1388, 1650. Very common.

220. Eritrichium Schrader.

629. Eritrichium spathulatum Clarke. var.?

Llonakh, 14,800 ft., No. 2147. The Llonakh plant is not quite the typical form found to the north (Khambajong in Tibet) and to the East (Thango in Sikkim). It is a compact little form, with usually only 1-3 flowers in the inflorescence which scarcely, if at all, exceeds the rosette of leaves.

630. Eritrichium ? acaule W. W. Smith sp. nov.

Habitu et nuculis facile ab omnibus himalaicis Eritrichiis distinctum; non sine dubio huic generi relatum.

Nanum, perenne, pilis brevibus patulis hirsutum, fere acaule; vel interdum *caules* plures decumbentes ad 2 cm. longi. *Folia radicalia* 7-10 mm. longa, elliptica vel spathulata, in petiolum (5-10 mm.) attenuata; *caulina* rara minora. *Flores* vel solitarii scapi more longe-pedunculati vel 2-4 in apice ramorum racemo contracto, fere sessiles, aggregati. *Calycis* 5-partiti sepala 1-1·5 mm. longa, corollæ tubum æquantia, lanceolata acuta vel subobtusa, sparse albo-hirsuta. *Corollæ* lobi rotundati. *Stamina* 5, tubo medio affixa, filamentis brevibus. *Nuculæ* 4, ovoideæ, glabræ, margine glochidiato dentato subcyathiferæ.

Naku La, Llonakh, Sikkim, 17,500 ft., No. 2811, in Kew and in Calcutta Herbaria.

631. Eritrichium pustulosum Clarke.

Zemu Valley, Naku La, Llonakh, Giagong, 13-17,000 ft., Nos. 1237, 1955, 2052, 2440. Not uncommon.

632. Eritrichium pygmæum Clarke.

Llonakh, Thango, 14-15,000 ft., Nos. 1837, 2394. Rare.

633. Eritrichium Munroi Clarke.

Zemu, Llonakh, 11-15,000 ft., Nos. 1219, 1395, 1486, 1572, 2046, 2066. Frequent.

var.

Llonakh, 14-16,000 ft., Nos. 1813, 1829, 2240. More erect and with longer inflorescence than the type.

var.

Thango, 13,000 ft. Fruits minutely pubescent.

634. Eritrichium tibeticum Clarke.
Zemu, Llonakh, 11-15,000 ft., Nos. 1158, 1354, 1686, 1708.
var. **minor.**
Naku La, Llonakh, 15,500-17,000 ft., Nos. 1876, 1938.

221. Microula Benth.

635. Microula Benthami Clarke.
Naku La, Llonakh, Giagong, 16-17,000 ft., Nos. 1949, 2395. A Tibetan plant which crosses over into Sikkim near the frontier. We have no previous specimen from Sikkim.

636. Microula sikkimensis (Clarke) Hemsl.
Thango, 13-14,000 ft., Nos. 2376, 2379.

222. Trigonotis Stev.

637. Trigonotis microcarpa Benth.
Cheungtong, 6,000 ft., No. 893.

638. Trigonotis rotundifolia Benth.
Llonakh, 14,500 ft., No. 1811.

639. Trigonotis sp. near **rotundifolia** Benth.
Perhaps only a variety of the above; forms a compact rosette nearly 10 cm. in diameter; the inflorescences very short and with smaller flowers than the type. Goraphu Chu, Llonakh, 15,700 ft., No. 2220.

640. Trigonotis multicaulis Benth.
Yumchho La, Zemu, Llonakh, 12-14,500 ft., Nos. 1181, 1607, 1921. Not quite the type; but both *T. rotundifolia* and this species seem to be variable: further material in good fruit is necessary for the limitation of the Himalayan species of this genus.

641. Trigonotis ovalifolia Benth.
Tista Valley, Lachen to Thango, 8-13,500 ft.

223. Myosotis Linn.

642. Myosotis Hookeri Clarke.
Rongsa, Naku La, Llonakh, 15-17,000 ft., Nos. 2035, 2806. Sparingly near the snow.

224. Onosma Linn.

643. Onosma Hookeri Clarke.
Llonakh, 15-16,000 ft., Nos. 1864, 2110.

644. Onosma bicolor Wall.
Lachen, Zemu, 8-9,000 ft., Nos. 952, 2802.

LV.—CONVOLVULACEÆ.

225. **Porana** Burm.

645. Porana racemosa Roxb.
Cheungtong, 6,000 ft., No. 2573.

226. **Cuscuta** Linn.

646. Cuscuta reflexa Roxb.
Lachen, 8,000 ft., No. 3054 Ribu.
647. Cuscuta europæa Linn.
Lachen and Zemu. 8-9,000 ft., No. 2760.

LVI.—SOLANACEÆ.

227. **Solanum** Linn.

648. Solanum crassipetalum Wall.
Tista Valley, 3-4,000 ft., No. 812.

LVII.—SCROPHULARIACEÆ.

228. **Scrophularia** Linn.

649. Scrophularia pauciflora Benth.
Zemu Valley, 12-13,000 ft., No. 1145.
650. Scrophularia elatior Benth.
Zemu Valley, 10,000 ft.. No. 2679.

229. **Mazus** Lour.

651. Mazus surculosus Don.
Cheungtong and Lachen, 6-8,000 ft., Nos. 920, 961.

230. **Lancea** Hook. f. & T.

652. Lancea tibetica H. f. & T.
Llonakh, Giagong, 14,500-15,000 ft., Nos. 1857, 2209.

231. **Lindenbergia** Lehm.

653. Lindenbergia urticæfolia Lehm.
Cheungtong, 6,000 ft., No. 898.

232. **Vandellia** Linn.

654. Vandellia nummulariæfolia Don.
Tista Valley, 4-5,000 ft., No. 847.

233. **Hemiphragma** Wall.

655. Hemiphragma heterophyllum Wall.
Lachen and Lachung, 8-9,000 ft., Nos. 2615, 2998 Ribu.

234. **Picrorhiza** Royle.

656. Picrorhiza Kurrooa Benth.
Zemu, Llonakh, 13-16,000 ft., Nos. 1343, 1965, 2251. Frequent.

235. **Veronica** Linn.

657. Veronica himalensis Don.
Zemu Valley, 11-12,000 ft., Nos. 1107, 1214.

658. Veronica ciliata Fisch.
Zemu, Llonakh, Thango, 13-16,000 ft., Nos. 1629, 1828, 2062, 2148, 2292. Frequent.

659. Veronica lanuginosa Benth.
Zemu, Llonakh, 15-16,000 ft., Nos. 1476, 2023.

660. Veronica cana Wall.
Zemu Valley, 10-12,000 ft., Nos. 1109, 1161.

661. Veronica capitata Benth.
Zemu Valley, 14,000 ft., No. 1352.

236. **Euphrasia** Linn.

662. Euphrasia officinalis Linn.
Zemu, Llonakh, 12-15,700 ft., Nos. 1589, 2218, 2678. Frequent.

237. **Pedicularis** Linn.

663. Pedicularis rhinanthoides Schrenk.
Naku Chu, Llonakh, 17,000 ft., No. 1945. New to Sikkim.

664. Pedicularis longifolia Rudolph.
Tumrachen Chu, Llonakh, Thango, 13-16,000 ft., Nos. 1695, 1908, 2090, 2246. A very conspicuous and common plant in the Llonakh marshes and plentiful also by the wayside below Thango. Usually a bright yellow.

665. Pedicularis siphonantha Don.
Zemu, Thango, 11-16,000 ft., Nos. 1127, 1156, 1260, 1546. Frequent.

666. Pedicularis megalantha Don.
Zemu Valley, 8,500 ft., No. 1003.

667. Pedicularis bella Hook. f.
Llonakh, 14-16,000 ft., Nos. 1988, 2078, 2121, 2360. Frequent.

668. Pedicularis nepalensis Prain.

Thé La, Naku Chu, Llonakh, 16-16,500 ft., Nos. 1971, 2179.

669. Pedicularis Elwesii Hook. f.

Zemu, Llonakh, Thango, 12-16,500 ft., Nos. 1212, 1566, 1787, 1969, 2340. Frequent.

670. Pedicularis integrifolia Hook. f.

Llonakh, 14,500 ft., Nos. 1862, 1915.

671. Pedicularis instar Prain.

Llonakh, 14,000 ft., No. 1780.

var. **paradoxa.**

Llonakh, 14,000 ft., No. 2077.

672. Pedicularis gracilis Wall.

Zemu Valley, 11-13,000 ft., Nos. 1455, 2683.

673. Pedicularis porrecta Wall.

Zemu Valley, 11,000 ft., No. 1171.

674. Pedicularis confertiflora Prain.

Naku Chu, Llonakh, Thango, 13-16,000 ft., Nos. 1893, 1993, 2354, 2550.

675. Pedicularis flexuosa Hook. f.

Zemu and Llonakh, 12-15,000 ft., Nos. 1370, 1724, 2685.

var.

Zemu Valley, 11,800 ft., No. 1213.

676. Pedicularis furfuracea Wall.

Lachen, Zemu, 8-10,000 ft., Nos. 1064, 2681.

677. Pedicularis Pantlingii Prain.

Lachen, Zemu, 9,500-11,000 ft., Nos. 971, 1000, 1656, 2680.

678. Pedicularis microcalyx Hook. f.

Llonakh, 14,000 ft., No. 2682.

679. Pedicularis carnosa Wall.

Lachen, Lachung, 9-10,000 ft., Nos. 2422, 2579.

680. Pedicularis sp. near **odontophora** Prain.

Zemu Valley, 10,800 ft., No. 1734. If found to be distinct from *P. odontophora* Prain, M. Bonati proposes to describe this species under the name of *P. Smithiana* Bonati.

681. Pedicularis sp. near **albiflora** Prain.

Thango, 14,000 ft., No. 2504. M. Bonati believes this to be distinct from *P. albiflora.*

682. Pedicularis Wallichii Bunge.

Zemu, Llonakh, 14-15,000 ft., Nos. 1259, 1435, 2002.

683. **Pedicularis excelsa** Hook. f.
Zemu, Llonakh, 9-11,000 ft., Nos. 1738, 2401.

684. **Pedicularis lachnoglossa** Hook. f.
Llonakh, 15,500 ft., No. 1863.

685. **Pedicularis trichoglossa** Hook. f.
Zemu, Llonakh, Thango, 12-16,000 ft., Nos. 1267, 1762, 1872, 1967, 2557. Frequent.

686. **Pedicularis Clarkei** Hook. f.
Zemu Valley 14,000 ft., No. 1253.

687. **Pedicularis schizorhyncha** Prain.
Thango, 14,000 ft., No. 2504 in part.

688. **Pedicularis alaschanica** Maxim.
Naku Chu, Llonakh, 15-16,000 ft., Nos. 1979, 2134. New to Sikhim.

689. **Pedicularis Roylei** Maxim.
Llonakh, 15-16,000 ft., Nos. 2034, 2259.

690. **Pedicularis diffusa** Prain.
Zemu Valley, 10-11,000 ft., Nos. 1147, 1178.

691. **Pedicularis denudata** Hook. f.
Zemu Valley, 13,000 ft., Nos. 1457, 1526.

692. **Pedicularis mollis** Wall.
Zemu Valley, 10-12,000 ft., Nos. 1641, 2684.

693. **Pedicularis Oederi** Vahl.
Nachegoh, Naku La, Thé La, Llonakh, 15-17,500 ft., Nos. 1714, 1901, 1948, 2172, 2306. New to Sikkim.

238. Oreosolen Hook. f.

694. **Oreosolen Wattii** Hook. f.
Upper Llonakh Valleys, 15-17,000 ft. Nos. 1941, 2214.

LVIII.—OROBANCHACEÆ.

239. Boschniackia C. A. Mey.

695. **Boschniackia himalaica** H. f. & T.
Zemu Valley, 11-14,000 ft., Nos. 1139, 1380.

LIX.—LENTIBULARIACEÆ.

240. Utricularia Linn.

696. **Utricularia Wallichiana** Wight.
var. **firmula.**
Lachen, 8-9,000 ft., No. 2413.

697. **Utricularia brachiata** Oliver.
Zemu Valley, 10-11,000 ft., No. 1733.
698. **Utricularia multicaulis** Oliver.
Thango, 13-14,000 ft., No. 2391.

241. **Pinguicula** Linn.

699. **Pinguicula alpina** Linn.
Llonakh, 16,000 ft., No. 1973.

LX.—GESNERACEÆ.

242. **Lysionotus** D. Don.

700. **Lysionotus serrata** D. Don.
Lachen, 7,000 ft., No. 2827.

243. **Didymocarpus** Wall.

701. **Didymocarpus Andersoni** Clarke.
Tista Valley, 4-5,000 ft., No. 833.
702. **Didymocarpus aurantiaca** Clarke.
Tista Valley, 3,000 ft., No. 804.
703. **Didymocarpus oblonga** Wall.
Lachen, 7,000 ft., Nos. 914, 927.
704. **Didymocarpus subalternans** Wall.
var. **curvicapsa.**
Cheungtong 6,000 ft., No. 899.
705. **Didymocarpus leucocalyx** Clarke.
Namchi, 4,000 ft., No. 844.
706. **Didymocarpus pulchra** Clarke.
Tista Valley, 3-4,000 ft., No. 814.

244. **Didissandra** Clarke.

707. **Didissandra lanuginosa** Clarke.
Tista Valley, Tong, Lachen, 4-7,000 ft., Nos. 822, 874.

245. **Chirita** Ham.

708. **Chirita Clarkei** Hook. f.
Lachen, 7,000 ft., No. 928.

LXI.—ACANTHACEÆ.

246. **Strobilanthes** Blume.

709. **Strobilanthes Wallichii** Nees.
Zemu Valley, 9-10,000 ft., No. 1032.

LXII.—SELAGINACEÆ.

247. **Lagotis** Gærtn.

710. **Lagotis glauca** Gærtn.
Llonakh, 14-15,000 ft., No. 1798.

711. **Lagotis crassifolia** Prain.
Zemu, Llonakh, 14-17,000 ft., Nos. 1615, 2358.

LXIII.—VERBENACEÆ.

248. **Vitex** Linn.

712. **Vitex heterophylla** Roxb.
Tista Valley, 3,000 ft., No. 801.

LXIV.—LABIATÆ.

249. **Plectranthus** L'Herit.

713. **Plectranthus scrophularoides** Wall.
Lachen, 8-9,000 ft., No. 2435.

250. **Elsholtzia** Willd.

714. **Elsholtzia polystachya** Benth.
Lachung, 8-9,000 ft., No. 2586.

715. **Elsholtzia densa** Benth.
Llonakh, Giagong, 15,000 ft., Nos. 2743 Ribu, 2890 Ribu.

716. **Elsholtzia eriostachya** Benth.
var. **typica.**
Lachen and Thango, 10-14,000 ft. Nos. 2374, 2927 Ribu.
var. **pusilla.**
Llonakh, 14,500 ft., Nos. 1825, 2096, 2226. Frequent.

717. **Elsholtzia strobilifera** Benth.
Lachen, Thango, 8-13,000 ft. Frequent.

251. **Calamintha** Mœnch.

718. **Calamintha umbrosa** Benth.
Cheungtong, Lachen, Zemu, 7-10,000 ft., Nos. 922, 2768. Frequent.

252. **Melissa** Linn.

719. **Melissa parviflora** Benth.
Tong, Cheungtong, Lachen, 5-9,000 ft., Nos. 865, 2423, 2831.

253. **Salvia** Linn.

720. Salvia glutinosa Linn.
Zemu Valley, 12,000 ft., No. 2770.

721. Salvia campanulata Wall.
Zemu Valley, 9-13,000 ft., Nos. 1048, 1195. Frequent.

254. **Nepeta** Linn.

722. Nepeta Thomsoni Benth.
Thango, 14,000 ft., No. 2382. Rare. A Tibetan plant.

723. Nepeta lamiopsis Benth.
Zemu, lower Llonakh, 10-13,000 ft., Nos. 1035, 1185, 1456, 1700. Frequent.

724. Nepeta discolor Benth.
Naku La, Llonakh, 16,000 ft., No. 1987.

255. **Dracocephalum** Linn.

725. Dracocephalum speciosum Benth.
Zemu, Llonakh, 13-14,500 ft., Nos. 1690, 1800.

726. Dracocephalum heterophyllum Benth.
Giagong, 16,000 ft., No. 2441. A Tibetan plant, occurring sparingly in Sikkim, a few miles from the frontier.

256. **Brunella** Linn.

727. Brunella vulgaris Linn.
Tong, Lachen, 5-8,000 ft., No. 848.

257. **Stachys** Linn.

728. Stachys melissæfolia Benth.
Lachen, Zemu, 8-10,000 ft., Nos. 2421, 2766, 2767.

258. **Galeopsis** Linn.

729. Galeopsis Tetrahit Linn.
Lachen, Thango, 10-13,000 ft. A weed near the villages.

259. **Phlomis** Linn.

730. Phlomis macrophylla Wall.
Zemu, Thango, 9,500-13,000 ft., Nos. 1030, 1662, 1731, 2544, 2717. Frequent.

731. Phlomis rotata Benth.
Llonakh, Thango, 14-17,000 ft., Nos. 2309, 2380.

260. **Eriophyton** Benth.

732. **Eriophyton Wallichianum** Benth.

Zemu, Llonakh, Thango, 14-16,000 ft., Nos. 1474, 2080, 2113, 2543. Frequent.

261. **Gomphostemma** Wall.

733. **Gomphostemma ovatum** Wall.

Tista Valley, 3,000 ft., No. 827.

262. **Teucrium** Linn.

734. **Teucrium palmatum** Benth.

Zemu Valley, 9,000 ft., No. 2769.

LXV.—PLANTAGINACEÆ.

263. **Plantago** Linn.

735. **Plantago major** Linn.

var. **asiatica.**

Tong to Lachen, 5-8,000 ft., No. 857.

736. **Plantago tibetica** H. f. & T.

Thango, 14,000 ft., No. 2925 Ribu. Not previously found in Sikkim.

LXVI.—ILLECEBRACEÆ.

264. *Genus ?*

737. No. 2094, Llonakh, 14,500 ft., appears to belong to this order, but so far I have failed to match it.

LXVII.—AMARANTACEÆ.

265. **Amarantus** Linn.

738. **Amarantus paniculatus** Linn.

Cultivated at Lachung, 9,000 ft., No. 2584.

266. **Stilbanthus** Hook. f.

739. **Stilbanthus scandens** Hook. f.

Namchi, 4,000 ft., No. 845.

LXVIII.—CHENOPODIACEÆ.

267. **Chenopodium** Linn.

740. **Chenopodium album** Linn.

Lachen in fields, 8-9,000 ft.

741. Chenopodium Botrys Linn.
Llonakh, 14-15,000 ft., No. 1997. A very dwarf form.

268. Microgynæcium Hook. f.

742. Microgynæcium tibeticum Hook. f.
Naku La, Llonakh, Thango, Giagong, 14-16,000 ft., Nos. 1992, 2726 Ribu, 2881 Ribu. Eaten by the Tibetan herdsmen who give it the name of 'Boktu.'

269. *Genus* ?

743. Chenopodiaceæ ?
No. 2812. Llonakh, 15,000 ft. Not yet determined.

LXIX.—PHYTOLACCACEÆ.

270. Phytolacca.

744. Phytolacca acinosa Roxb.
Cheungtong, 6-7,000 ft., No. 2611.

LXX—POLYGONACEÆ.

271. Polygonum Linn.

745. Polygonum islandicum Hook. f.
Llonakh, No. 207 Younghusband.

746. Polygonum delicatulum Meisn.
Lachen, Zemu, Llonakh 9-16,000 ft., Nos. 1411, 1593, 1699, 1877, 2416 Frequent.

747. Polygonum filicaule Wall.
Zemu Valley, 9-13,000 ft., Nos. 1034, 1410.

748. Polygonum viviparum Linn.
Zemu, Llonakh, Thango, 14-16,000 ft., No. 1790.

749. Polygonum sphærostachyum Meissn.
Zemu, Llonakh, 12-16,000 ft., Nos. 1547, 1766, 1913, 2255.

750. Polygonum perpusillum Hook. f.
Zemu, Llonakh, Thango, 14-16,000 ft., Nos. 1291, 1417, 1444, 1510, 2505. Frequent.

751. Polygonum affine Don.
Nangma La, Llonakh, 15,000 ft., No. 2809 Ribu.

752. Polygonum vacciniifolium Wall.
Llonakh, 11-12,000 ft., No. 1743.

753. Polygonum Emodi Meisn.
Zemu, Llonakh, 10-11,000 ft., Nos. 2643, 2644.

754. Polygonum microcephalum Don.
Cheungtong, 5,000 ft., No. 2642.

755. Polygonum runcinatum Ham.
Lower Llonakh, 10-11,000 ft.

756. Polygonum arifolium Linn.
Cheungtong, 6,000 ft.

757. Polygonum molle Don.
Lachen, 7,000 ft.

758. Polygonum polystachum Wall.
Zemu Valley, 12-13,000 ft., No. 2640.

759. Polygonum campanulatum Hook. f.
Zemu Valley, 11-12,000 ft., No. 2641. Frequent.

760. Polygonum tortuosum Don.
Llonakh, 15,500 ft., No. 1867. Not previously recorded for Sikkim. A large plant considering the exposed situation.

761. Polygonum sibiricum Laxm.
Llonakh, Giagong, 14,500-17,000 ft., Nos. 1920, 1946, 2398.

762. Polygonum Hookeri Meisn.
Naku La, Llonakh, 15,500-17,000 ft., Nos. 1927, 2344.

763. Polygonum nummularifolium Meisn.
Zemu, Llonakh, Thango, 14-17,000 ft., Nos. 1511, 1569, 1983, 2257, 2514.

272. **Fagopyrum** Gærtn.

764. Fagopyrum cymosum Meisn.
Tong to Lachen, 5-8,000 ft., Nos. 882, 2670.

765. Fagopyrum tataricum Gærtn.
Cheungtong to Lachen. Cultivated.

273. **Rheum** Linn.

766. Rheum spiciforme Royle.
Upper valleys of Llonakh, 15-16,000 ft., No. 2114. A plant of the dry western ranges, not previously recorded for Sikkim.

767. Rheum acuminatum H. f. & T.
Zemu Valley, 9-14,000 ft., Nos. 1042, 1595. Frequent.

768. Rheum nobile H. f. & T.
Zemu, Llonakh, Thango, 14-16,000 ft., No. 1268. Frequent.

274. **Oxyria** Hill.

769. Oxyria digyna Hill.
Zemu, Llonakh, 11-16,000 ft., Nos. 1179, 1961. Frequent.

275. **Rumex** Linn.

770. **Rumex nepalensis** Spreng.
Tong, Lachen, Zemu, 5-10,000 ft., Nos. 852, 915. Common.

LXXI.—ARISTOLOCHIACEÆ.

276. **Aristolochia** Linn.

771. **Aristolochia saccata** Wall.
Tong, 5,000 ft.

LXXII.—PIPERACEÆ.

277. **Peperomia** Ruiz & Pav.

772. **Peperomia Heyneana** Miq.
Tista Valley, 3-4,000 ft., No. 815.

LXXIII.—LAURACEÆ.

278. **Machilus** Nees.

773. **Machilus Gamblei** King.
Tong, 4,000 ft., No. 876.

279. **Litsæa** Lamk.

774. **Litsæa citrata** Bl.
Lachung, 9,000 ft., No. 2583.
775. **Litsæa** sp.
Zemu Valley, 9,500 ft., No. 1044.

280. **Lindera** Thumb.

776. **Lindera heterophylla** Meissn.
Zemu Valley, 10,000 ft., No. 2813.

LXXIV.—THYMELÆACEÆ.

281. **Daphne** Linn.

777. **Daphne cannabina** Wall.
Tista Valley, 5-6,000 ft. Frequent.
778. **Daphne retusa** Hemsl.
Thango, 14,000 ft., No. 2828 Ribu.

282. **Edgeworthia** Meissn.

779. **Edgeworthia Gardneri** Meissn.
Gangtok, Tong, 5-6,000 ft. Frequent.

LXXV.—ELÆAGNACEÆ.

283. Elæagnus Linn.

780. **Elæagnus latifolia** Linn.
Zemu Valley, 8,000 ft., No. 1017.

284. Hippophae Linn.

781. **Hippophae rhamnoides** Linn.
Llonakh, 15-16,000 ft., Nos. 2227, 2365. Not previously recorded from Sikkim.

782. **Hippophae salicifolia** Don.
Lachen, Llonakh, 8-12,000 ft., Nos. 983, 2761. Considered by Hooker as probably a form of the above *H. rhamnoides* which replaces it in the drier upper valleys of Llonakh.

LXXVI.—LORANTHACEÆ.

285. Loranthus Linn.

783. **Loranthus elatus** Edgew.
Zemu Valley, 8,500 ft., No. 990.

LXXVII.—SANTALACEÆ.

286. Thesium Linn.

784. **Thesium himalense** Royle.
var. **pachyrhiza** Hook. f.
Thé La, Llonakh, Giagong, 15-16,000 ft., Nos. 2173, 2462.

LXXVIII.—BALANOPHORACEÆ.

287. Balanophora Forst.

785. **Balanophora involucrata** Hook. f.
Lachen and Zemu Valley, 8-9,000 ft., Nos. 1007, 2734.

LXXIX.—EUPHORBIACEÆ.

288. Euphorbia Linn.

786. **Euphorbia himalayensis** Boiss.
Lachen, Zemu, Llonakh, 9,500-11,500 ft., Nos. 1058, 1745.

787. **Euphorbia sikkimensis** Boiss.
Cheungtong to Lachen, 7-9,000 ft., No. 892.

88. **Euphorbia Stracheyi** Boiss
Zemu, Llonakh, 13-16,000 ft., Nos. 1247, 1481, 1855.

289. **Sarcococca** Lindl.

789. **Sarcococca pruniformis** Lindl.
Cheungtong, Lachen, 6-9,000 ft., No. 924.

290. **Daphniphyllum** Bl.

790. **Daphniphyllum himalayense** Muell.-Arg.
Lachen, Zemu, 8-9,000 ft., Nos. 980, 2828. Common.

291. **Antidesma** Linn.

791. **Antidesma acuminatum** Wall.
Tista Valley, 3-4,000 ft., No. 810.

292. **Macaranga** Thouars.

792. **Macaranga denticulata** Muell.-Arg.
Tista Valley, 3-4,000 ft., No. 807.

293. **Baliospermum** Bl.

793. **Baliospermum corymbiferum** Hook. f.
Tista Valley, 4-5,000 ft., No. 853.

LXXX.—URTICACEÆ.

294. **Urtica** Linn.

794. **Urtica hyperborea** Jacq.

Giagong and Kangralamo, 16,500 ft., No. 2459. Not previously recorded from Sikkim. Occurs rarely but when it does is very conspicuous amid the surrounding dwarf vegetation on the exposed slopes.

795. **Urtica parviflora** Roxb.
Lachung, 8,000 ft.

796. **Urtica dioica** Linn.

Llonakh, 14,500 ft., No. 1834. Not previously recorded from Sikkim. As it was found in the vicinity of a 'dok' or station for yaks, it is probably an introduction from Tibet.

295. **Laportea** Gaud.

797. **Laportea terminalis** Wight.
Zemu Valley, 9,000 ft., No. 2796.

296. **Pilea** Lindl.

798. **Pilea approximata** Clarke.
Zemu, Llonakh, 9-11,500 ft., Nos. 1029, 1748.

799. Pilea umbrosa Wedd.
Tista Valley, 4-5,000 ft., No. 830.

800. Pilea sp ?
Yumchho La, 15,000 ft., No. 1328. Very dwarf.

297. Lecanthus Wedd.

801. Lecanthus Wightii Wedd.
Zemu, 8-10,000 ft., No. 2797.

298. Elatostema Forst.

802. Elatostema sikkimense Clarke.
Tong, 4,500 ft., No. 858.

803. Elatostema obtusum Willd.
Zemu Valley, 10,000 ft., No. 1066.

299. Bœhmeria Jacq.

804. Bœhmeria polystachya Wedd.
Lachung, 8-9,000 ft., No. 2826.

300. Pouzolzia Gaud.

805. Pouzolzia viminea Wedd.
Tista Valley, Lachen, 3-8,000 ft., Nos. 817, 982.

LXXXI.—JUGLANDACEÆ.

301. Juglans Linn.

806. Juglans regia Linn.
Cheungtong, 6,000 ft.

LXXXII.—CUPULIFERÆ.

302. Betula Tourn.

807. Betula utilis Don.
Zemu Valley, 8-9,000 ft., No. 994.

303. Alnus Gærtn.

808. Alnus nepalensis Don.
Zemu Valley, 8-9,000 ft.

304. Corylus Linn.

809. Corylus ferox Wall
Lachen, Zemu, Lachung, 8-9,000 ft., Nos. 1006, 2588, 2748.

LXXXIII.—SALICACEÆ.

305. Salix Linn.

810. Salix viminalis Linn.
var. **Smithiana** ?
Zemu Valley, 9-12,000 ft., Nos. 1045, 1132, 1665. Probably *S. eriophylla* of the Khasia Hills.

811. Salix sp. near **obscura** Anderss.
Lachen, 9,000 ft., No. 2829.

812. Salix sp. near **Daltoniana** Anderss.
Zemu Valley, 12,000 ft., No. 1226 bis.

813. Salix Serpyllum Anderss.
Zemu Valley, 12,000 ft., Nos. 1210, 1223.

814. Salix Lindleyana Wall.
Llonakh, 12-14,000 ft., Nos. 1767, 2053.

815. Salix calyculata Hook. f.
Zemu, Llonakh, Thango, 11-14,000 ft., Nos. 1121, 1133, 1768, 2497. Frequent.

816. Salix oreophila Hook. f.
Naku La, Llonakh, 16,000 ft., No. 1995.

817. Salix Thomsoniana Anderss.
Zemu Valley, 12-13,000 ft., No. 1134.

818. Salix sp. near **Thomsoniana** Anderss.
Llonakh, 15,500 ft., No. 2230.

819. Salix sp.
Llonakh, 14,500 ft., No. 2157.

The material of Salix in the Calcutta Herbarium is too inadequate for accurate identification of the species.

306 Populus Linn.

820. Populus ciliata Wall.
Cheungtong, Lachen, 6-8,000 ft., Nos. 925, 953.

MONOCOTYLEDONES.

LXXXIV.—ORCHIDACEÆ.

307. Microstylis Nutt.

821. Microstylis Wallichii Lindl.
Tista Valley, 4,000 ft., No. 829.

822. Microstylis muscifera Ridley.
Lachen, Zemu Valley, 8,000-8,500 ft., Nos. 987, 2653, 2658.

308. Liparis Richard.

823. **Liparis perpusilla** Hook. f.
Lachen, 8,000 ft., Nos. 2646, 2665.

309. Oreorchis Lindl.

824. **Oreorchis foliosa** Lindl.
Lachen, Zemu, 8-11,000 ft., Nos. 1117, 2645 bis.
825. **Oreorchis micrantha** Lindl.
Lachen, 8,000 ft., No. 2645.

310. Bulbophyllum Thouars.

826. **Bulbophyllum affine** Lindl.
Namchi, 4,000 ft., No. 839.

311. Cirrhopetalum Lindl.

827. **Cirrhopetalum parvulum** Hook. f.
Lachen, 8,000 ft., No. 2661.
828. **Cirrhopetalum caudatum** King & Pantl.
Lachen, 8,000 ft., No. 2649.

312. Eria Lindl

829. **Eria graminifolia** Lindl.
Lachen, 700 ft., No. 913.
830. **Eria excavata** Lindl.
Cheungtong, 6,000 ft., No. 910.
831. **Eria pannea** Lindl.
Namchi, 4,000 ft., No. 838.

313. Spathoglottis Bl.

832. **Spathoglottis ixioides** Lindl.
Lachen, Lachung, 7,500-8,500 ft., Nos. 938, 2666. Frequent locally.

314. Ceratostylis Bl.

833. **Ceratostylis teres** Reichb. f.
Tista Valley, 3-4,000 ft., No. 821.

315. Cryptochilus Wall.

834. **Cryptochilus sanguinea** Wall.
Namchi, 4,000 ft., No. 836.

316. Calanthe Br.

835. Calanthe alismæfolia Lindl.
Tista Valley, 3,000 ft., No. 823.

836. Calanthe alpina Hook. f.
Lachen, Zemu, 8-10,000 ft., Nos. 1024, 2654, 2656, 2660. Frequent.

317. Luisia Gaud.

837. Luisia inconspicua Hook. f.
Tista Valley, 3-4,000 ft., No. 813.

318. Sarcochilus Br.

838. Sarcochilus suaveolens Hook. f.
Tista Valley, 3-4,000 ft., No. 813.

319. Cleisostoma Bl.

839. Cleisostoma gemmatum King & Pantl.
Namchi, 4,000 ft., No. 837.

320. Anæctochilus Bl.

840. Anæctochilus pumilus King & Pantl.
Lachen, 8,000 ft., No. 2847.

321. Spiranthes Rich.

841. Spiranthes australis Lindl.
Lachen, Lachung, 7-8,000 ft., Nos. 2613, 2667.

322. Listera Br.

842. Listera tenuis Lindl.
Lachung, 8,000 ft., No. 2651.

843. Listera pinetorum Lindl.
Zemu, 11,000 ft., No. 1118.

844. Listera Lindleyana King & Pantl.
Lachung, 8,000 ft., Nos. 2662, 2668.

323. Aphyllorchis Bl.

845. Aphyllorchis Pantlingii W. W Smith, sp. nov.

Ab *Aphyllorchide alpina* habitu erecto et bractea et floribus parvis, etiam ab aliis himalaicis congeneribus magna bractea statim distinguitur.

Rhizoma breve, radicibus multis fibrosis fasciculatis globum 3-4 cm. diametientem fingentibus. *Caulis* 15-30 cm. altus, 2-5 mm. diametiens, parte inferiori glaber, parte superiori pubescens rubris squamis indutus, 2—3-foliatus. *Folia* squamiformia subæqualia, obtusa. *Racemi* 10–30-floriferi. rubro-pubescentes. *Flores* 5 mm. diametientes, laxe racemosi vel interdum 2-3 approximati, cum ovario 1 cm. longi ; bractea 5-16 mm. longa, linearis vel lineari-oblonga, acuminata, erecta, ovarium et interdum florem excedens. *Sepala* 3-4 mm. longa, subæqualia, oblonga, obtusa. *Petala* minora, obtusa. *Labellum* variabile esse videtur, nunc oblongum, sepala paullo excedens, nunc angustius, fere duplo, excedens apice involuto bifido. *Capsula* 7-8 mm. longa, 5 mm. lata, ovoidea, costata, areolata, seminibus squamiformibus.

Lachen and Zemu Valley, Nos. 1020, 2657. Named in honour of the late Mr. Robert Pantling, the authority on Himalayan orchids.

324. **Epipactis** Br.

846. **Epipactis latifolia** Sw.
Lachen, 8-9,000 ft., Nos. 2648, 2650.

325. **Orchis** Linn.

847. **Orchis Chusua** Don.
Lachen, Zemu, 10-13,500 ft., Nos. 1067, 1241, etc. Frequent.

848. **Orchis habenarioides** King and Pantl.
Zemu, 11-12,000 ft., No. 1083.

326. **Herminium** Linn.

849. **Herminium orbiculare** Hook. f.
Zemu, 12,000 ft., No. 1594.

850. **Herminium gracile** King & Pantl.
Zemu Valley, 14,000 ft., No. 1463.

851. **Herminium quinquelobum** King & Pantl.
Lachen, 8,600 ft., No. 2412.

327. **Habenaria** Willd.

852. **Habenaria pectinata** Don.
Lachung, 8-9,000 ft., No. 2585.

853. **Habenaria Orchidis** Hook. f.
Zemu, Valley, 14,000 ft., No. 1464.

854. **Habenaria Aitchisoni** Reichb. f.
Lachen, 8,000 ft., Nos. 2663, 2669.
var. **Josephi** Hook. f.
Llonakh, 15,500 ft., No. 1882.

855. **Habenaria stenantha** Hook. f.
Lachen, 8,000 ft., No. 2655.

856. **Habenaria densa** Wall.
Lachen, 9,000 ft., Nos. 2299, 2664.

857. **Habenaria fallax** King & Pantl.
Lachen, 8,000 ft., Nos. 2652, 2659.

328. **Satyrium** Swartz.

858. **Satyrium nepalense** Don
var. **ciliata** Lindl.
Cheungtong, 7,000 ft., No. 2604.

329. **Cypripedium** Linn.

859. **Cypripedium elegans** Reichb. f.
Zemu Valley, 13,500 ft., No. 1462

860. **Cypripedium himalaicum** Rolfe.
Zemu Valley, 13-14,000 ft., No. 1240.

861. **Cypripedium tibeticum** King.
Zemu Valley, 13,000 ft., No. 1453.

LXXXV.—SCITAMINEÆ.

330. **Roscoea** Smith.

862. **Roscoea purpurea** Sm.
Lachen, 7-9,000 ft., Nos. 940, 947.

331. **Cautleya** Royle.

863. **Cautleya lutea** Royle.
Cheungtong, 6,000 ft., No. 906.

332. **Hedychium** Kœnig.

864. **Hedychium densiflorum** Wall.
Lachen, 8-9,000 ft., No. 2437.

865. **Hedychium ellipticum** Ham.
Tista Valley, 3-4,000 ft. No. 818.

866. **Hedychium gracile** Roxb.
Var. **glauca** Baker.
Lachung, 8,000 ft., No. 2580.

867. **Hedychium coccineum** Ham.
Cheungtong, 6,000 ft., No. 2612.

LXXXVI.—HÆMODORACEÆ.

333. Aletris Linn.

868. **Aletris nepalensis** Hook. f.
Zemu Valley, 10-12,000 ft., Nos. 1125, 1126. Frequent.

869. **Aletris sikkimensis** Hook. f.
Lachen, Zemu, Llonakh, 8-14,000 ft., Nos. 958, 965, 1084, 2004. Frequent.

334. Ophiopogon Ker.

870. **Ophiopogon Wallichianus** Hook. f.
Lachen, 9-11,000 ft.

871. **Ophiopogon intermedius** Don.
Zemu, 8-9,000 ft., Nos. 999, 2639.

LXXXVII.—IRIDACEÆ.

335. Iris Linn.

872. **Iris** sp. near **Clarkei** Baker.
Lachung, 10,000 ft., No. 2596. In fruit only.

LXXXVIII.—LILIACEÆ.

336.—Smilax Linn.

873. **Smilax rigida** Wall.
Lachen, 8-9,000 ft., No. 2430.

874. **Smilax elegans** Wall.
Lachen, 8-9,000 ft., No. 3046 Ribu.

337. Polygonatum Tourn.

875. **Polygonatum Hookeri** Baker.
Thé La, Llonakh, No. 2698 Ribu.

876. **Polygonatum verticillatum** All.
Zemu Valley, 9-13,000 ft., Nos. 1038, 1202, 1454. Very common.

877. **Polygonatum cirrifolium** Royle.
Lachen, Zemu, 8-14,000 ft., Nos. 974, 1346. Frequent.

338. Streptopus Mich.

878. **Streptopus simplex** Don.
Lachen, Zemu, 8-14,000 ft., Nos. 978, 1051, 1448, 1597. Frequent.

339. Smilacina Desf.

879. **Smilacina pallida** Royle.
Zemu, 12-13,000 ft., No. 1144.

880. **Smilacina fusca** Wall.
Zemu, 10-11,000 ft., No. 2637.

881. **Smilacina oleracea** H. f. & T.
Lachen, Zemu, 8-11,000 ft., Nos. 973, 2638. Very common.

340. Theropogon Maxim.

882. **Theropogon pallidus** Maxim.
Lachen, Zemu, 7-9,000 ft., Nos. 935, 957, 959.

341. Chlorophytum Ker.

883. **Chlorophytum undulatum** Wall.
Cheungtong, 6,000 ft., No. 897.

342. Allium Linn.

884. **Allium Wallichii** Kunth.
Lachung, 10,000 ft., No. 2595.

885. **Allium sikkimense** Baker.
Llonakh, 14,500-15,000 ft., No. 2105.

886. **Allium victorialis** Linn.
Zemu, Llonakh, Thango, Giagong, 10-14,500 ft., Nos. 1082, 1242, 1688, 2480, 2547. Frequent.

var. **angustifolia**, Hook. f.
Thango, 13,000 ft. With the type.

887. **Allium Gageanum** W. W. Smith sp. nov.

Species *Allio Govaniano* Wall. affinis; sed caule rotundo, foliis acutis, stylo longo præter alia signa distincta.

Glabrum. *Caulis* ad 30 cm. altus, erectus, vix compressus, basi foliatus. *Bulbi* anguste fusiformes, plures, cæspitosi, brevi rhizomati insidentes; ad bulborum apices fibræ multæ erectæ, ad 3 cm. longæ, liberæ basi excepto, non-reticulatæ, caulis basin laxe induentes. *Folia* subdisticha, ad 25 cm. longa, 2-3 mm. lata, linearia, plana, longe acuta, caulem fere æquantia. *Umbella* pluriflora, sphærica; spatha scariosa, plerumque in duos lobos partita. *Pedicelli* flore longiores, erecti vel exteriores deflexi. *Sepala* albida 5-6 mm. longa, lineari-oblonga, acuta, interdum apiculata, demum reflexa. *Filamenta* subulata, basi nec dilatata, sepalis paulo breviora, demum sepalis reflexis exserta. *Stylus* longitudine staminum. *Ovarium* subgloboso-trigastrum, 4 mm. diametiens, dimidio superiore pubescente, loculis 1—2-seminiferis. *Semina*, 2·5 mm. longa, plano-convexa.

Upper valleys of Llonakh, Sikkim, 15-16,000 feet, Nos. 2130 Smith & Cave, 2771 Ribu. Found in loose alluvium by the side of streams.

888. Allium macranthum Baker.

Thango, 14,000 ft., Nos. 2378, 2560.

889. Allium sp.

Llonakh, 12,000 ft., No. 1750. Not matched but in bud only.

343. **Lilium** Linn.

890. Lilium giganteum Wall.

Lachen, Zemu, 8-11,000 ft., No. 2636. Occasional.

891. Lilium roseum Wall.

Cheungtong, Lachen, 7-9,000 ft., No. 3080 Ribu.

344. **Fritillaria** Linn.

892. Fritillaria Stracheyi Hook. f.

Yumchho La, Zemu, Llonakh, 14-16,000 ft., Nos. 1358, 1376, 1602. A dwarf form found close to the snow.

893. Fritillaria cirrhosa Don.

Zemu, 13-14,000 ft., No. 2635.

345. **Lloydia** Salisb.

894. Lloydia serotina Reichb.

Throughout the Zemu and Llonakh valleys from 13-17,000 feet, Nos. 1243, 1255, 1295, 1712, 1789.

346. **Tofieldia** Huds.

895. Tofieldia himalaica Baker.

Yumchho La, Zemu, 11-13,000 ft., Nos. 1447, 1590, 2801.

347. **Clintonia** Rafin.

896. Clintonia alpina Kunth.

Zemu Valley, 8-15,000 ft., Nos. 998, 1433. Frequent.

348. **Trillium** Linn.

897. Trillium Govanianum Wall.

Zemu Valley, 11,000 ft., No. 1113.

349. **Paris** Linn.

898. Paris polyphylla Smith.

Cheungtong to Lachen, 6-9,000 ft., Nos. 926, 930.

LXXXIX.—COMMELINACEÆ.

350. Commelina Linn.

899. **Commelina sikkimensis** Clarke.
Cheungtong, 5,000 ft., No. 2803.

XC.—JUNCACEÆ.

351. Juncus Linn.

900. **Juncus bufonius** Linn.
Above Thango, No. 2876 Ribu.

901. **Juncus effusus** Linn.
Zemu Valley, 8-9,000 ft., No. 2809.

902. **Juncus chrysocarpus** Buch.
Zemu, Thango, 10-13,000 ft., Nos. 1065, 1162, 1403.

903. **Juncus prismatocarpus** Br.
Cheungtong, 6-7,000 ft. Frequent.

904. **Juncus triglumis** Linn.
Zemu, 14-15,000 ft., No. 1366.

905. **Juncus** sp. near. **triglumis** Linn.
Thangchung La, Zemu, 15,000 ft., No. 1470.

906. **Juncus leucomelas** Royle.
Llonakh, 14,500 ft., No. 1911.

907. **Juncus bracteatus** Buch.
Zemu, 10-14,000 ft., Nos. 1239, 2808.

908. **Juncus sphacelatus** Decne.
Llonakh, 14,000 ft., No. 2071.

909. **Juncus himalensis** Klotzsch & Garcke.
Zemu, 12-13,000 ft., Nos. 1148, 1397.

910. **Juncus sikkimensis** Hook. f.
Yumchho La, Zemu, 15-16,000 ft., Nos. 1428, 1442.

911. **Juncus concinnus** Don.
Zemu, 13,000 ft., No. 2807.

912. **Juncus minimus** Buch.
Zemu, 12-15,000 ft., Nos. 1396, 1441.

913. **Juncus Clarkei** Buch.
Cheungtong, 6,000 ft., No. 895.

352. Luzula D.C.

914. Luzula effusa Buch.

Lachen, Zemu, 10-11,000 ft., Nos. 1081, 2810.

Young states of this, as seen in some of our specimens, correspond with the doubtful species of Fl. Brit. Ind., Vol. VI, p. 402. This latter, collected by Hooker and by Pantling was referred doubtfully by Buchenau to *L. parviflora* var. *subcongesta.*

915. Luzula campestris D.C.

Zemu, 11-13,000 ft., Nos. 1120, 1150, 1169.

XCI.—ARACEÆ.

353. Arisæma Mart.

916. Arisæma tortuosum Schott.

Tong, 4-5,000 ft., No. 877.

917. Arisæma nepenthoides Mart.

Lachung, 9,000 ft., No. 2594.

918. Arisæma consanguineum Schott.

Tong, 4-5,000 ft., No. 878.

919. Arisæma concinnum Schott.

Llonakh, No. 2700 Ribu.

920. Arisæma Jacquemontii Bl.

Zemu, Thango, 8-12,000 ft., Nos. 1011, 1049, 2293.

354. Typhonium Schott.

921. Typhonium diversifolium Wall.

Lachen, 8,000 ft., No. 2848.

XCII.—NAIADACEÆ.

355. Triglochin Linn.

922. Triglochin maritimum Linn.

Llonakh, 14,500 ft., No. 1854.

356. Potamogeton Linn.

923. Potamogeton javanicus Hassk. ?

Thango, 14,000 ft., No. 2515.

XCIII.—ERIOCAULACEÆ.

357. Eriocaulon Linn.

924. **Eriocaulon alpestre** Hook. f. & T.
Lachen, 8,000 ft., No. 3064 Ribu.

925. **Eriocaulon** sp.
Thango, 14,000 ft., No. 2850.

XCIV.—CYPERACEÆ.

358. Eleocharis R. Br.

926. **Eleocharis palustris** R. Br.
Llonakh, 14,500 ft., No. 1912.

359. Bulbostylis Kunth.

927. **Bulbostylis capillaris** Kunth.
Lachen, Zemu, 9,000 ft., Nos. 2816, 2996 Ribu.

360. Scirpus Linn.

928. **Scirpus setaceus** Linn.
Zemu, 12,000 ft., No. 2817.

929. **Scirpus Caricis** Retz.
Llonakh, 14-15,000 ft., Nos. 1815, 2055, 2067.

361. Kobresia Willd.

930. **Kobresia pygmæa** Clarke.
Llonakh, 14,500 ft., No. 1817.

931. **Kobresia** sp.
Zemu, 17,000 ft., No. 1583.

362. Carex Linn.

932. **Carex nubigena** D. Don.
Lachen, 7,000 ft., No. 919.

933. **Carex longipes** Don.
Lachen, 9,000 ft.

934. **Carex linearis** Boott.
Thangchung La, Zemu, 16,000 ft., No. 1480

935. **Carex pulchra** Boott.
Zemu, 9,000 ft., No. 2815.

936. Carex munda Boott.
Zemu, 10-13,000 ft., Nos. 1080, 1685.

937. Carex alpina Sw.
Yumchho La. 15,000 ft., No. 1443.

938. Carex Lehmanni Drejer.
Zemu, 11,000 ft., No. 1085.

939. Carex obscura Nees.
Zemu, 12-13,000 ft., No. 1189.

940. Carex Moorcroftii Falc. var.
Jongsong La Valley, Llonakh, 16,500 ft., No. 2318. Not previously recorded from Sikkim.

941. Carex ustulata Wahl.
Zemu, Llonakh, 11-15,000 ft., Nos. 1086, 1879, 2108, 2155. Frequent.

942. Carex cruenta Nees.
Zemu, 14-15,000 ft., No. 1372.

943. Carex finitima Boott.
Zemu, 10,000 ft., No. 1073.

944. Carex inanis Kunth.
Lachen, Zemu, 8-10,000 ft., Nos. 2814, 2825.

945. Carex sp.
Llonakh, 16,500 ft., No. 2321.

946. Carex sp.
Llonakh, 16,000 ft., No. 1986.

XCV.—GRAMINEÆ.

363. **Miscanthus** Anders.

947. Miscanthus nudipes Hack.
Zemu, 9-10,000 ft., No. 1036.

Hierochloa Gmel.

948. Hierochloa Hookeri Clarke.
Zemu, 9-10,000 ft., No. 1036.

364. **Stipa** Linn.

949. Stipa purpurea Griseb.
Naku La, Llonakh, 16,000 ft., No. 2769 Ribu.
Not previously recorded from Sikkim.

950. Stipa mongolica Turcz.
Llonakh, 14,700 ft., No. 2106.

365. **Oryzopsis** Michx.

951. **Oryzopsis** sp.
Giagong, No. 2862 Ribu.

366. **Phleum** Linn.

952. **Phleum alpinum** Linn.
Zemu, Thango, 11-13,000 ft., Nos. 1099, 1186.

367. **Agrostis** Linn.

953. **Agrostis myriantha** Hook. f.
Lachen, 8,000 ft., No. 3012 Ribu.

954. **Agrostis inæquiglumis** Griseb.
Above Lachen, 12,000 ft.

368. **Calamagrostis** Adans.

955. **Calamagrostis emodensis** Griseb.
Zemu, 11,000 ft., No. 2824.

369. **Deyeuxia** Clar.

956. **Deyeuxia scabrescens** Munro.
Zemu, 10-11,000 ft., No. 1079.

957. **Deyeuxia pulchella** Hook. f.
Naku La, Llonakh, 15,000 ft., No. 2737 Ribu.

370. **Deschampsia** Beauv.

958. **Deschampsia cæspitosa** Beauv.
Zemu, Llonakh, 11-16,000 ft., Nos. 1647, 1868, 2070. Frequent.

371. **Avena** Linn.

959. **Avena aspera** Munro.
Zemu, Tallum Samdong, 9-11,000 ft., Nos. 2410, 2823.

960. **Avena subspicata** Clairv.
Zemu, Llonakh, 13-17,000 ft., Nos. 1385, 2107, 2236. Frequent.

961. **Avena flavescens** Linn.
Zemu, 10-12,000 ft., No. 2818.

372. **Danthonia** D.C.

962. **Danthonia cachemyriana** Jaub. & Spach
Thango, 14,000 ft., No. 2465
var. **minor** Hook. f.
Thango, 14,000 ft., No. 2554.

373. **Tripogon** Roth.

963. **Tripogon filiformis** Nees.
Lachen, 8-10,000 ft.

374. **Catabrosa** Beauv.

964. **Catabrosa sikkimensis** Stapf.
Llonakh, 14,500 ft., No. 1909.

375. **Eragrostis** Beauv.

965. **Eragrostis nigra** Nees.
Lachen, 8-9,000 ft., No. 3003 Ribu.

376. **Poa** Linn.

966. **Poa pseudo-pratensis** Hook. f.
Zemu, Llonakh, 12-16,000 ft., No. 1413.

967. **Poa attenuata** Trin.
Kangralamo, 16,000 ft., No. 2452.

968. **Poa flexuosa** Wahlb.
Zemu, Llonakh, Giagong, 11-15,000 ft., Nos. 1412, 1960, 2169.

377. **Festuca** Linn.

969. **Festuca valesiaca** Schleich.
var. **tibetica** Stapf.
Naku La, Llonakh, 17,000 ft., No. 1947.

970. **Festuca Cumminsii** Stapf ?
Llonakh, 14,500 ft., No. 1818.

971. **Festuca polycolea** Stapf.
Zemu, 11-13,000 ft., Nos. 1108, 1229.

378. **Agropyron** Gærtn.

972. **Agropyron longe-aristatum** Boiss.
Llonakh, 16,000 ft., No. 2235.

GYMNOSPERMÆ.

XCVI.—GNETACEÆ.

379. **Ephedra** Linn.

973. **Ephedra Gerardiana** (Wall.) Stapf.
var. **sikkimensis** Stapf.
Llonakh, Thango, 14-15,000 ft., Nos. 2001, 2075, 2158, 2381. Frequent.

XCVII.—CONIFERÆ.

380. Cupressus Linn.

974. Cupressus funebris Endl.
Lachung, 8,000 ft.

381. Juniperus Linn.

975. Juniperus pseudo-sabina Fisch. & Mey.
Zemu, Llonakh, 11-16,000 ft., Nos. 1091, 1563, 1676. Frequent.

976. Juniperus recurva Ham.
Zemu, Llonakh, 10-15,000 ft. Frequent.
var. **squamata** Parlat.
Llonakh, 14-16,000 ft. Frequent.

382. Podocarpus L'Hérit.

977. Podocarpus neriifolia Don.
Tista Valley, 3,000 ft., No. 826.

383. Pinus Linn.

978. Pinus longifolia Roxb.
Tista Valley, Namchi, 3-5,000 ft. Occasional.

384. Picea Link.

979. Picea morindoides Rehder.
Zemu, 8-9,000 ft., Nos. 1021, 2731.

385. Tsuga Carr.

980. Tsuga Brunoniana Carr.
Zemu, 8-10,000 ft., No. 2742.

386. Abies Juss.

981. Abies Webbiana Lindl.
Zemu, 9-12,000 ft., No. 1391.

387. Larix Mill.

982. Larix Griffithii H. f. & T.
Lachen, Zemu, Lachung, 8-10,000 ft., Nos. 2600, 2771.

PTERIDOPHYTA.

XCVIII.—POLYPODIACEÆ.

388. **Davallia** Sm.

983. **Davallia** sp. near **Clarkei** Baker.
Tumrachen, Zemu Valley, 12,000 ft., No. 1673.

389. **Adiantum** Linn.

984. **Adiantum pedatum** L.
Lachen, Zemu, 8-9,000 ft., Nos. 2833, 3094 Ribu.

390. **Cheilanthes** Schwartz.

985. **Cheilanthes farinosa** Kaulf.
Zemu, 9,000 ft., No. 2842.

391. **Cryptogramme** R. Br.

986. **Cryptogramme crispa** R. Br.
Zemu, Llonakh, 12-13,000 ft., Nos. 1341, 1638. Frequent.

392. **Woodwardia** Sm.

987. **Woodwardia radicans** Sm.
Tong, 5,000 ft., No. 890.

393. **Athyrium** Roth.

988. **Athyrium thelypteroides** Michx.
Zemu, 11-12,000 ft., Nos. 1639, 1643.

989. **Athyrium fimbriatum** Wall.
var. **sphæropteroides** Clarke.
Zemu Valley, 12,000 ft., No. 2844.

394. **Aspidium** Sw.

990. **Aspidium lachenense** Hook.
Llonakh, 14,500 ft., No. 1806

991. **Aspidium ilicifolium** Don.
Zemu, 10,000 ft., No. 2841.

395. **Polystichum** Roth.

992. Polystichum Prescottianum (Wall).
Zemu, 12,000 ft., Nos. 1637, 1642.
var. **Bakeriana.**
Zemu, Thango, 13-16,000 ft., Nos. 1553, 2290. Not uncommon.

396. **Lastrea** Presl.

993. Lastrea Filix-mas (L.)
var. **cochleata** (Don.)
Lachen, 8-9,000 ft., No. 2845.
994. Lastrea Brunoniana Wall.
Llonakh, 14-14,500 ft., No. 1799.
995. Lastrea barbigera Hook.
Thango, 14,000 ft.

397. **Goniophlebium** Bl.

996. Goniophlebium Hendersoni Atkin.
Zemu, 12,000 ft., No. 1672.
997. Goniophlebium amœnum (Wall.)
Zemu, 9,000 ft., No. 2843.
998. Goniophlebium subamœnum Clarke.
Zemu, 10,000 ft., No. 2838.

Polypodium Linn.

998A. Polypodium rostratum Hook.
Zemu, 12,000 ft., No. 1636.
999. Polypodium lineare Thunb.
Zemu, 9,000 ft., No. 2837.
1000. Polypodium malacodon Hook.
Zemu, 12,000 ft., Nos. 1586, 1644. Frequent.
var. **major.**
Zemu, 10,000 ft., No. 2839.
1001. Polypodium ebenipes Hook.
Zemu, 11,000 ft., No. 2834.

398. **Nothochlæna** R. Br.

1002. **Nothochlæna Marantæ** R. Br.
Zemu, 15,000 ft., No. 2835.

399. **Acrostichum** Linn.

1003. **Acrostichum tricuspe** Hook.
Namchi, 4,000 ft., No. 842.

XCIX.—OSMUNDACEÆ.

400. **Osmunda** Linn.

1004. **Osmunda Claytoniana** Linn.
Zemu, 9-10.000 ft., No. 2840.

C.—OPHIOGLOSSACEÆ.

401. **Botrychium** Sw.

1005. **Botrychium Lunaria** Sw.
Zemu, 11,000 ft., Nos. 1116, 1585.
1006. **Botrychium virginianum** Sw.
var. **lanuginosa**.
Lachen, 8,000 ft., No. 3995 Ribu.

CI.—LYCOPODIACEÆ.

402. **Lycopodium** Linn.

1007. **Lycopodium Selago** H. f. & T.
Yumchho La, Naku La, Llonakh, 15-16,000 ft., Nos. 1275, 1962.
1008. **Lycopodium serratum** Thunb.
Zemu, 9,000 ft., No. 2832.
1009. **Lycopodium alpinum** Linn.
Zemu, 12-13,000 ft., No. 1337.

CII.—SELAGINELLACEÆ.

403. **Selaginella** Spreng.

1010. **Selaginella caulescens** Spreng.
Cheungtong to Lachen, 5-9,000 ft. Frequent.

ADDENDUM I.

Since the first pages were printed off, I have received from M. Hamet a report on the *Crassulaceæ* submitted to him. Several new species are distinguished as well as two 'additions (of previously known species) to the flora of India. A paper by M. Hamet on these *Crassulaceæ* will appear later with descriptions of the new species. Meanwhile the following list is available.

Sedum quadrifidum Pall.

Zemu, Llonakh, Thango, 14-17,000 ft., Nos. 1266, 1804, 1930, 2026, 2054, etc. Very common.

Sedum himalense Don.

Zemu, Llonakh, Giagong, 12-15,000 ft., Nos. 1203, 1749, 2476, 2761 Ribu. Common.

Sedum bupleuroides Wall.

Zemu, Llonakh, Thango, 11-15,000 ft., Nos. 1105, 1494, 1756, 1923, 2151, 2727, 2794 Ribu. Common.

Sedum elongatum Wall.

Zemu, Llonakh, 12,000 ft., Nos. 1015, 1649, 1741.

Sedum roseum Stev.

Rongsa, Thé La, Goraphu Chu, 15-16,000 ft., Nos. 2024, 2205, 2714 Ribu.

Sedum asiaticum D.C.

Zemu, Llonakh, 12-14,500 ft., Nos. 1621, 2726.

Sedum trullipetalum H. f. & T.

Thango, 13-14,000 ft., Nos. 2468, 2552.

Sedum multicaule Wall.

Cheungtong to Lachen, 5-8,500 ft., Nos. 888, 2427, 2602.

Sedum Levii R. Hamet.

Naku Chu, Llonakh, 16,000 ft., No. 1989.

Sedum Smithi R. Hamet, sp. nov.

Llonakh, 15,000 ft., No. 2126.

Sedum Gagei R. Hamet.

Giagong, 16,000 ft., No. 2444.

Sedum Fischeri R. Hamet.

Naku La, Chhortenima La, 16-17,000 ft., Nos. 1940, 2350.

Sedum Cavei R. Hamet, sp. nov.

Yumchho La, Zemu, Llonakh, 12-14,500 ft., Nos. 1206, 1299, 2051.

Sedum Oreades R. Hamet.

Llonakh, 11,000 ft., No. 1747.

Sedum Przewalskii Maxim.

Thango, 15-16,000 ft., No. 2393. New to the flora of India.

Sedum verticillatum (H. f. & T.) R. Hamet.

Zemu, Llonakh, 9-11,000 ft., No. 1055. Common.

Sedum filipes Hemsl.

Cheungtong, 6,000 ft., No. 900. New to the flora of India.

Sedum Quevai R. Hamet, sp. nov.

Zemu, Llonakh, 12-14,500 ft., Nos. 1228, 1296, 1306, 1764, 1776.

ADDENDUM II.

I am much indebted to Mr. Hoffmann of Messrs. Johnston and Hoffmann, Calcutta, who has given me permission to reproduce two of his photographs taken when accompanying Mr. White in 1891. One shows very well the general aspect of the Zemu valley before the tall trees disappear; the other illustrates the piebald effect of the dwarf Juniper on the rounded hillocks in Llonakh.

CORRIGENDA.

Page 142, line 16 from base, supply the word *Sir* at the beginning of the line.

Page 16, line 6, for 4-900 read 4-9,000.

Page 180. **Arenaria Littledalei** Hemsl. has been made the type of a new genus **Gooringia** Williams. It is figured in Hook. Icones, Tab. 2944 (1911). *Arenaria thangoensis* is not included in this new genus.

Page 199. **Casearia sp.** I have incorrectly referred this fruiting specimen to *Casearia*. It ought to be *Stachyurus himalaicus* H. f. & T.

SOME ADDITIONS TO THE FLORA OF THE EASTERN HIMALAYA.

By W. W. Smith.

Most of the plants referred to in the following pages formed part of a collection made in May-June 1905 by J. C. White, Esq., C.I.E., at that time Political Officer in Sikkim, during a tour along the borders of Tibet and Bhutan wherein was included a visit to Pari and Punakha. This collection he generously handed over to the Herbarium of the Royal Botanic Garden, Sibpur; and he supplemented it by a further collection made in 1906-07 in Eastern Bhutan.

Of the flora of Bhutan very little is known, and these collections are consequently of considerable interest. The flora of the western side of Bhutan probably bears a close resemblance to the adjoining parts of Sikkim and Chumbi; and these collections support the view. At the same time many new species are to be got in this western portion and further east, Bhutan will no doubt eventually give a rich yield especially of alpine forms.

The present collections contain several new species and also plants which have not come to light for over 50 years—plants collected by Griffith and by Booth, who are the chief and almost the only botanists who have ever been in the Bhutan Highlands. In the genus *Primula* besides the resurrection of *Primula mollis* Booth, two new species have come to light, a description of which is given below.

I have included some new species from Sikkim.

ORDER—**RANUNCULACEÆ.**

Calathodes palmata H.f. & T.
Lingji, Bhutan, 7,500 ft., No. 45 *White*!
Rare in Sikkim. An addition to the flora of Bhutan.

ORDER—**CRUCIFERÆ.**

Eutrema himalaicum H. f. & T.
No. 243 *White!*
An addition to the flora of Chumbi.

Erysimum longisiliquum H. f. & T.
Byagha, No. 177 *White!*
An addition to the flora of Bhutan.

Lepidium ruderale Linn.
Dongdong, Bhutan; *White!*
An addition to the flora of Bhutan.

ORDER—**BURSERACEÆ.**

Garuga Gamblei King, nomen tantum in Herb. Horti Bot. Calcuttensis, sp. nov.

Species *Garugæ pinnatæ* Roxb. affinis; paniculis longis gracilibus, floribus minoribus, filamentis ovarioque glabris, fructu multo minore statim distincta.

Arbor magna; descriptio abest. Apex ramorum ut in *G. pinnata* sed glabrior; foliorum insertiones et cicatrices et caulis medulla persimiles. *Folia* 30-45 cm. longa, alterna, exstipulata, imparipinnata, ramulorum apices versus conferta, adulta saltem cum rhachide tereti glaberrima, juniora non visa; *foliola* sæpius 6-8-juga, 5-15 cm. longa, 3·5-5 cm. lata, stipellis nullis, subsessilia vel brevissime petiolulata (2-3 mm.), ovato-oblonga, anguste acuminata, basi paululum cordata vel obtusa, margine crenato-serrata, membranacea, nervis lateralibus ± 20 paribus prominentibus. *Paniculæ* novellorum ramulorum apices versus confertæ, 20-30 cm. longæ, in fructu ad 40 cm., racemose-ramosæ, ramulis extremis cymosis; paniculæ dimidium inferius nudum, glabrum, superius tomentosum, bracteolis 5-10 mm. longis lanceolatis sessilibus serius deciduis. *Pedicellæ* 2-3 mm. longæ. *Calycis* 2 mm. longi extus tomentelli vel puberuli tubus intus glaberrimus, 10-crenatus; lobi quinque triangulares, tubum subæquantes, intus glabri. *Petala* 5, 3 mm. longa, ovata, patenti-recurva, extus tomentella, intus glabra.

Stamina 10, ad disci marginem inserta; filamenta episepalia epipetalibus longiora, subulata, glabra, petalorum dimidium superantia. *Ovarium* 1 mm. longum, 5-loculare, glabrum vel minute-pubescens, stylo robusto glabro 2 mm. longo, stigmate capitato 5-lobo. *Fructus* 5 mm. diametiens, drupa, pyrenis sæpius 1-2 subglobosis lignosis, testa crustacea.

Sikkim Himalaya at an elevation of 1,500-5,000 ft. This species of *Garuga* seems to have been collected first in Sikkim by the late Sir George King in 1875, (No. 2385 *King!* 1,500 ft., without precise locality). On the sheet is written in his handwriting "? Garuga but not pinnata; get flowers." The next record is that of Mr. J. S. Gamble—Chumbati, 2,500 ft., No. 600! Then Dungboo, King's native collector, supplied specimens from Ryang Jhora 2,000 ft., marked "Big tree, 50 ft., fruit; Dungboo says flowers in March without leaves." All these are in mature fruit only and no flowers evidently had been secured, when some years later specimens were sent to Kew for comparison with the material there. These were returned with the following note by Dr. Stapf attached to *Gamble* No. 600. "I think this is a new species of Garuga. It differs from *G. pinnata* in the long slender panicles, in the small fruit which is supported by the *persistent* calyx, the tube of which is much shorter than in *G. pinnata*. We have exactly the same plant from the Nilgherries (*Gardener*) and *Hb. Wight* 398-2; and possibly also *Wall. H.* 1-8485 D. belongs to it (in flower only!)"

On examining the specimens of *Garuga* in the Calcutta Herbarium I find one Nilgherry sheet—no collector's name or number—which has the long panicles and small fruits of the Sikkim plant. There are unfortunately no flowers. Our Wallichian sheet 8485 is F. and is an undoubted *Garuga pinnata* Roxb. collected according to the Catalogue in the Calcutta Botanic Garden. 8485 D. according to the same Catalogue is a mixture of Hardwar and Sylhet specimens. Evidently no flowering specimens were secured by Sir George King and the species remained unpublished. This year the native collectors of the Lloyd Botanic Garden, Darjeeling, have brought in (under No. 4169 *Kari!*) flowering specimens of a tall tree collected near Sittong in the month of April at 5,000 ft. which in leaf and inflorescence are identical with *Gamble* No. 600. The flower is that of *Garuga* but very distinct from that of *Garuga pinnata*. In the absence of flowers it is difficult to say whether the Nilgherry and certain small fruited Javan specimens are conspecific. I think it better meanwhile to regard the distribution of the species as Sikkim. In the flowering specimens now available the leaflets are dropping, so that Dungboo's statement that at flowering time the tree is more or less bare is probably correct.

ORDER—**CELASTRACEÆ.**

Euonymus tibeticus W. W. Smith, sp. nov.

Euonymo grandifloro Wall. affinis pedunculis trifloris, floribus tetrameris; sed foliis minoribus lanceolatis statim distincta.

Arboris descriptio deest. *Rami* virides, glaberrimi, tetragoni. *Folia* usque ad 3 cm. longa, ad 7 mm. lata, opposita, longe-lanceolata, subobtusa, basi cuneata, ad 3 mm. petiolata, obscure crenulata, nervis obscuris. *Pedunculi* 1-1·5 cm. longi, aggregati, plerumque 2-3-flori, pedicellis 5-6 mm. longis. *Calyx* 4-fidus, 2 mm. longus, lobis ovatis obtusis patentibus. *Petala* 4, 2 mm. longa, suborbicularia, subintegra *Stamina* 4, supra discum inserta. *Discus* carnosus, amplus, margine undulatus. *Ovarium* cum disco confluens, 4-loculare; stylus brevis, stigmate 4-lobo; ovula in loculo 2; fructus immaturus ei *E. grandiflori* similis, globosus, 4-angulatus, glaber.

Lhakhang, Tibet, at an elevation of 11,500 feet, No. 87 *White!*

ORDER—**ROSACEÆ.**

Spenceria ramalana Trimen.

Among the Bhutan specimens is a species of *Spenceria* which I am unable to separate specifically from the Chinese plant. The Bhutan plant is shorter, has smaller leaves and flowers than the single type of *S. ramalana* in the Calcutta Herbarium, but there is no great distinction except perhaps in the number of stamens, which is about one-half of what are present in the described type which has thirty. The small size of the flower may quite well account for this. The Bhutan specimen on comparison with the types at Kew is taken to be very near, if not actually, *S. ramalana*. This monotypic genus has been recorded previously only from China. (*Gill, Delavay* No. 214, *Pratt* Nos. 588, 701, *Soulié* Nos. 658, 894, *Potanin, Hosie,*) and is an interesting addition to the flora of the Indian area. The plant was collected near Dong-La, Eastern Bhutan.

Cydonia cathayensis Hemsl.

Near Bongthang(?) No. 159 *White !*

An addition to the Flora of Bhutan. It appears to be variable in the degree of ferruginous pubescence on the leaves, and in the size of the fruit. Even the mature leaves in this specimen retain a thick covering of ferruginous tomentum.

Pirus bhutanica W. W. Smith, sp. nov.

Species sectionis *Ariæ,* inter himalaicas *Piro vestitæ* affinis ; foliis parvis trilobis, inter alia signa statim distincta.

Arboris descriptio deest. *Caulis* primo dense pubescens, deinde glabrescens. *Folia* petiolata ; petiolus 1-1·5 cm. longus, pubescens ; lamina 2·5—4·5 cm. longa, 2-3 cm. lata, triloba ad medium, lobis ovatis vel ellipticis acutiusculis serratis, supra paucis sparsis capillis, infra rugosula, venulis plus minus pubescentibus, basi cuneata, stipulis 5-10 mm. longis lanceolatis plus minus persistentibus instructa. *Flores* 4-8, in ramulis lateralibus corymbosi, fere fasciculati ; pedicelli ad 2 cm. longi, tomentosi. *Calycis* tomentosi tubus 3 mm. longus, urceolatus ; lobi quinque ad 3 mm. longi, triangulares, obtusi, reflexi. *Petala* 7-8 mm. longa, orbicularia, intra albo-lanata. *Stamina* 15 vel plura. *Styli* 5, basi lanati ; *ovarium* 5-loculare ; *fructus* immaturus.

Tibet and Bhutan Himalaya, near Lhakhang Gumpa, *White!* The structure of the flower makes this an ally of *Pirus vestita* Wall ; the leaves are entirely different.

ORDER—SAXIFRAGACEÆ.

Ribes Grossularia Linn.

Lhakhang valley, 11,500 feet, No. 70 *White !*

An addition to the Flora of Tibet.

Saxifraga Gageana W. W. Smith, sp. nov.

Species ad sectionem *Boraphilarum* spectans ; habitu, foliis, capsula subvesiculosa affinis ; sed floribus rubris, ovario planissimo facile distincta.

Radix repens, gracilis. *Caulis* ad 8 cm. longus, flexuosus, sæpius solitarius, *Saxifragæ micranthæ* cauli depauperatæ similis, subglaber

paucis sparsis capillis albis. *Folia radicalia* 2-4; lamina ·5-3 cm. longa, petiolo ad 2 cm. longo fragili, minora spathulata integra, majora ovata grosse dentata fere lobata; *folia caulina* 1-2, 1-2 cm. longa, 1-2 cm. lata, late ovata, interdum latiora quam longa, sessilia, grosse dentata, fere glabra paucis albis capillis, *Saxifragæ pallidæ* more carnosula. *Pedicelli* 8-15 mm. longi. *Flores* 1-3, terminales et axillares; interdum subflore terminali alter parvula bractea lanceolata. *Torus* latus. *Sepala* 5, patentia, 5 mm. longa, viridia, ovario paulum adnata, lobis 3 mm. longis 2 mm. latis ovato-oblongis obtusis glabris. *Petala* 3·5-4 mm. longa, patentia, calycem paulum excedentia, lobis obovatis integris vel subemarginatis rubris. *Stamina* 10, dimidium corollæ æquantia, filamentis purpureis. *Ovarium* disciforme, 1 mm. altum, diametro 5 mm. × 4 mm., carpellis margine subtrilobatis vesiculosis viridibus; styli ad 1 mm. longi, sæpius minores, virides, apice purpureo, paralleli, interdum adpressi sed usque ad basin distincti. *Semina* non visa.

Chola Range, East Sikkim at 14-15,000 ft., Nos. 3809, 3989, *Smith!* A species very distinct from all the other Himalayan saxifrages and remarkable for its disc-like ovary.

ORDER—**UMBELLIFERÆ.**

Pimpinella radiata W. W. Smith, sp. nov.

Glabrā. *Folia* pinnata vel bipinnata, segmentis omnium foliorum ovatis vel ovatis-lanceolatis acutis serratis. *Pedunculi* in fructu ad 3 cm. longi, rigidi, circumradiati, pedicellis brevissimis 1 mm. longis vel interdum nullis. *Fructus* ovatus. *Pimpinellæ Hookeri* valde affinis est.

Sikkim Himalaya at Yeumtong, 11,000 feet, No. 992, *Gammie!* and Sebu Valley, 13,000 feet, *Gammie!*

The three species—*Pimpinella Hookeri* Clarke, *P. tenera* Benth. and *P. radiata* sp. nov—form a natural group among the Himalayan Pimpinellas. The most striking common feature is the frequency of excessively elongate tails to the petals. This is not uniformly present, as Clarke points out (Fl. Brit. India Vol. II, p. 686) in the case of *P. Hookeri* and *P. tenera* nor in *P. radiata* as I have myself noted. *P. radiata* is closely allied to *P. Hookeri* and is distinguished by the peculiar character of the umbel which, when the fruit is mature, shows a circum-

radiate arrangement of *rigid* peduncles terminated by 1-3 almost sessile clustered fruits which are somewhat longer than broad. Lower leaves are not whitened beneath; nor are the upper leaves reduced to linear segments as in *P. Hookeri.*

Another plant occurring both in the Sikkim and Bhutan Himalaya presents a very different appearance to *Pimpinella Hookeri* but is I believe referable to that species. In this variety all the leaves have the segments very long narrow-linear. The characters of flower and fruit are quite according to type. I have found the plant in the field mixed with true *P. Hookeri* and I have no doubt it is merely a variety. I have named it *P. Hookeri* Benth. var. *graminifolia* (var. nov.) Bhutan Himalaya at Pun-ka-bee-see-moo No. 247 *Dungboo*! Sikkim Himalaya at Yakcha, Lachung Valley, 10,000 ft., No. 2714 *Smith and Cave!* Zemu Valley, 9-10,000 ft., *Smith and Cave!* also *Gammie!* and *King's Coll*! without definite locality.

ORDER—RUBIACEÆ.

Uncaria macrophylla Wall.

At Rungbee, 1,600 ft., No. 266 *Smith!* an addition to the Flora of Sikkim. Distribution—North Bengal, Bhutan, Assam, Burma.

ORDER—COMPOSITÆ.

Senecio arnicoides Wall.

Above Lachen, 12,000 ft., No. 3018 *Ribu!*

An addition to the Flora of Sikkim. A Central and Western Himalayan plant, not previously recorded from the Eastern Himalayas and apparently very rare there.

ORDER—CAMPANULACEÆ.

Cyananthus Hookeri Clarke

This species was originally described from specimens in ripe fruit only, collected by Sir Joseph Hooker in East Nepal. More material is now to hand including flowering specimens from Sikkim, Tibet and Chumbi. The corolla is very small for the genus, up to 7 mm.—only half that of its nearest ally, *C. inflatus* H. f. & T.,—narrow tubular, slightly exceeding the calyx, light blue in colour. A further point of distinction is its tetramery. In all the Tibet and Chumbi specimens dissected, the calyx and corolla were four-lobed; in the fruiting Sikkim specimens the ovary is usually four-valved, and the calyx with four large lobes and a small one. Its distribution is about as extensive as is known for any *Cyananthus*:—Wallanchoon, Nepal, 13,000 ft., *Hooker;* Kup-Chee, Chumbi, No. 182 *King's Collector!* Sikkim, 13,000 ft., *Pantling!* Sebu Valley, Sikkim, 15,500 ft., No. 1155 *Gammie!* Numa, Tibet, *Stewart!* Phembu La, 10 miles N. of Llasa, *Walton!*

var. *hispidus* Franch. Nepal, No. 175 *Scully!* Tongolo, Eastern Tibet, No. 672 *Soulié!* West Szechuen, China, No. 454 *Pratt!*

ORDER—**VACCINIACEÆ.**

Pentapterygium sikkimense W. W. Smith, sp. nov.

Species *Pentapterygio serpenti* Klotzsch, affinis; sed foliis late ellipticis et floribus parvis facile distinguitur.

Frutex epiphyticus; habitus *P. serpentis. Caulis* vagans, ramosus, pendulus vel serpens, strigoso-hispidus, laxe foliosus. *Folia* subsessilia, 2-3 cm. longa, 1·5 cm. lata, elliptica, apice rotundata vel obtusa, mucrone brevi, basi obtuso-cuneata, subintegra, apice serrulata, nervis 8-10 paribus supra clare reticulatis. *Flores* parvi, solitarii vel 2-3 fasciculati; pedicelli 5 mm. longi, glandulo-pubescentes. *Calyx* 5 mm. longus, ad medium fissus, turbinato-globosus, 5-pterus, subglaber, lobis acutis triangularibus persistentibus. *Corolla* 1 cm. longa, tubulosa, 5-gona, ad sextam partem lobata, glabra, rubra; lobi sublineares, acuti. *Stamina* 10, inclusa, corollæ tubo fere æquilonga, filamentis brevissimis liberis; antheræ cohærentes, loculis muticis in tubulos tenuissimos strictos loculis paulo longiores rimis elongatis dehiscentes productis. *Ovarium* 5-loculare, stylo filiformi, stigmate truncatulo. *Fructus* immaturus carnosus ad 7 mm. longus.

Sikkim:—Lachung Valley, 7,500 ft., No. 1216, *Gammie!* Tonglo, 7,500 ft., *Rogers!*

ORDER—**PRIMULACEÆ.**

Primula Whitei W. W. Smith, sp. nov.

Hæc species ad *Petiolares* Pax, sine dubio pertinet; verisimiliter affinis *Primulæ odontocalyci* (Franch.) Pax, ex China centrali (quæ

species Herbariis Kewensi et Calcuttensi deficitur) sed foliis exterioribus squamis reductis et farinosis, scapo brevi, lobis calycis oblongis satis distincta est.

Glabra, farinosa. *Folia* interiora ± 10, tenuiter membranacea, in petiolum mediocrem alatum attenuata, ad 7 cm. longa, ad 2 cm. lata, elliptica, ambitu obtusa, basin versus cuneata, leviter eroso-denticulata; *folia* exteriora ± 20, ad 2·5 cm. × 1·5 cm., squamiformi-reducta, coriacea et intus valde farinosa, arcte compacta. *Scapus* brevis, 1·5-2 cm. longus, flores 5-10 gerens. *Bracteæ* 6-10, ad 1·5 cm. longæ, lineares *Flores* longiuscule pedicellati; pedicelli ad 4 cm. longi, quam folia breviores. *Calyx* ad 8 mm. longus, tubulosus, *Primulæ petiolaris* calyce robustior, coriaceus, ad medium fissus; lobi oblongi, obtusi, ad 3 mm. lati, paulum divergentes, apice 3-5-dentati. *Corollæ* probabiliter purpureæ tubus calycem ad 4 mm superans, ad 12 mm. longus, infundibuliformis, ore annulatus; limbus 2-2·25 cm. diametiens; lobi obcordati, paulum dentati. *Capsula* tubo calycis dilatato inclusa; seminibus immaturis.

Pēle-la, Bhutan, at an elevation of 10,100 feet. 122 *White!*

Primula Jonarduni W. W. Smith, sp. nov.

Ab omnibus indicis Primulis foliis bracteisque facile distincta. Ad *Farinosas* Pax, est affinitas.

Parvula, glabra, farinosa. *Rhizoma* robustum, ad 3 cm. persistens, vetustis foliis in apice vestitum, ramos emittens. *Folia* parva 8-12 mm. longa, 4-5 mm. lata, petiolata, ovata, obtusa, integra, subtus farinosa, coriacea, etiam matura revoluta; cutis rugosa laxissima translucida; petiolus arcte distinctus, ad 5 mm. longus, alatus. *Scapus* ad 5 mm. longus, fructu duplo porrectus, pubescens. *Bracteæ* 2-3, ad 5 mm. longæ, ad 4 mm. latæ, irregulariter scutiformes, intus farinosæ, calycem ad medium velantes. *Calyx* 3-4 mm. fere ad imum in lobos ellipticos fissus, pubescens. *Corollæ* purpureæ tubus calycem vix superans vel æquans, breviter infundibuliformis; limbus 5-9 mm. diametiens; lobi obcordati, emarginati. *Capsula* globosa calycem haud excedens; semina non visa.

Bod La, Bhutan, at an altitude of 14,000 feet No. 69 *White!* Named after Babu Jonardun Nusker who has worked with enthusiasm in the Calcutta Herbarium for forty years and has acquired an extensive knowledge of the Indian Flora.

ORDER—LOGANIACEÆ.

Buddleia tibetica W. W. Smith, sp. nov.

Ab aliis himalaicis Buddleiis adhuc cognitis foliis parvis tomentosis distinguitur.

Caulis fruticosus, infra rotundatus, glaber, cortice cinereo, supra quadrangularis fulvo tomento indutus, multis delapsorum foliorum basibus approximatis valde nodosus. *Folia* 4 cm. longa, 3 cm. lata, opposita, ovata, basi breviter hastata, crenata, subacuta, dense utrinque tomento fulvo velutino obtecta, nervis 5-6 paribus infra perspicuis. *Flores* in cymas densissimas terminales fere globosas 5-7 cm. longas 3-5 cm. latas. *Calyx* 5 mm. longus, 2 mm. latus, dense fulvo-tomentosus, quatuor dentibus 5 mm. longis subacutis. *Corolla* 1 cm. longa, fere glabra, tubo 1 mm. lato calycem duplo excedente, lobis brevibus rotundatis. *Stamina* quatuor in medio tubo inserta. *Ovarium* ovoideum, hirsutum, minimum, immaturum.

At an elevation of 11,000 ft. on the Tibetan side of the Himalayas in the Lhakhang valley, to the north of Bhutan, No. 72 *White !*

ORDER—SCROPHULARIACEÆ.

Calorhabdos Brunoniana Benth.

Between Cheungtong and Lachung, Sikkim, 6,000 ft., No. 2858 *Smith and Cave !* An addition to the Flora of Sikkim. An interesting find as the plant is recorded only from Gossain Than, Nepal, and that only once by Wallich, and from China, at the foot of Thangshan, near Tali, *Delavay* No. 3161 (*vide* Hook. Ic. Plant. fig. 2669.)

ORDER—BORAGINACEÆ.

Trichodesma calycosum Coll. et Hemsl.

An addition to the Flora of Sikkim. Originally described in 1889 by Collett and Hemsley in their "Plants from Upper Burma and the Shan States." It was found much earlier in the Darjeeling District by Mr. J. S. Gamble in 1879, No. 7544 ! by Mr. G. A. Gammie in 1886 ! but remained undescribed until the Shan State specimen was obtained. It is at the present time not an uncommom plant among the specimens sent in by the Lloyd Botanic Garden seed-collectors.

ORDER—**ARISTOLOCHIACEÆ.**

Asarum himalaicum H. f. & T. VAR. **bhutanica** W. W. Smith, var. nov.

Folia, petioli, pedunculi capillis longis multicellularibus induti. Folia irregulariter cordata sinu lato.

Byagha, Bhutan No. 166 *White !* Not quite matched among the types of *Asarum himalaicum* in Kew and in Calcutta Herbaria ; but not I think specifically distinct.

ORDER—**ORCHIDACEÆ.**

Aerides Greenii W. W. Smith, sp. nov.

Species *A. cylindrico* Lindl. (non Hook.) affinis, sed flore parvo 2 cm. diametiente distinguitur.

Caulis ad 20 cm. *Folia* 6-10 cm. longa, 30 mm. lata, carnosa, teretia. *Flos* in brevissimo pedunculo solitarius ; *sepalum* dorsale vix longius quam latum, rotundatum ; *petala* subsimilia angustiora ; *labellum* sepalis brevius, ad imum gynostemii adnatum, *Vandarum* more dorsatum ; *pollinia* subglobosa bifida.

An *Aerides* with slender ridged stem ; the leaves with a groove above, taper slightly to a somewhat pointed apex. The peduncle extra-axillary, 30 mm., suberect, clothed with a few short brown scale-bracts. The dorsal sepal with a slight notch at the apex ; the lateral pair more elongated, with undulating margin, apex thickened and coming to an obtuse point, more distinctly streaked with purple than the dorsal. Petals widespread, somewhat more irregular and less rounded than the dorsal sepal. The lip with large obliquely oblong side lobes, the apical lobe fleshy with ridges down the centre. The general colour is creamy white with purple markings ; the lip is spotted with deep purple on the under side and bright yellow spots above ; spur purple. This new species of *Aerides* was brought from Bhutan by native collectors and flowered in the conservatory of Mr. H. F. Green of the Government Cinchona plantation, Munsong, Darjeeling. It was shown to Mr. R. Pantling, the authority on Himalayan orchids, and he recognised it as distinct from anything previously recorded from the East Himalaya. To him and to Mr. R. A. Rolfe of Kew I am indebted for allocating the plant to its correct place next to *Aerides cylindricum* Lindl. (non Hook). When I saw it, one flower only had appeared and this I dissected, figured and described at the time. Drawings of the plant are now in the Kew and Calcutta Herbaria.

Order—SCITAMINEÆ.

Hedychium Greenii W. W. Smith, sp. nov.

A Speciebus omnibus himalaicis *Gandasulii* sectionis rubris floribus facile distinguitur.

Caulis 60-180 cm. *Folia* 20-25 cm. longa, 5 cm. lata, oblonga, acuminata, subtus paulum pubescentia. *Spica* ad 12 cm., densiflora. *Bracteæ* 5-7 cm. longæ, 3-4 cm. latæ, ovatæ, acutæ, imbricatæ, floribus 2-3. *Calyx* ad 4·5 cm. longus, tubulosus, tridentato pilosulo apice, ad basin paucis argenteis pilis indutus. *Corollæ* tubus 4-4·5 cm. longus; lobi prælongi, lineares, ad 4 cm. longi, apice subspathulato. *Staminodia* 3-4 cm. longa, linearia, rubra; *stamen* 3-4 cm. longum, filamento rubro; *labellum* 3·5-4 cm. longum, 3-4 cm. latum, breviter bifidum, rubrum. *Ovarium* supra hirsutulum duabus epigynis glandulis. *Semina* matura non visa. Typi tabulæque in Herb. Kew. et. Herb. Calc. conservati.

Low hills in Western Bhutan. The plant was brought to Sikkim by native collectors and flowered in cultivation at the residence of Mr. H. F. Green who was the first to observe that it differed from any known Sikkim form. The lip is dark red while the linear lobes of the corolla are much lighter. The plant is now in cultivation in the Royal Botanic Garden, Calcutta and it is hoped that it will shortly be introduced to European gardens. It forms bulbils very freely.

SOME ADDITIONS TO THE FLORA OF BURMA

By W. W. Smith

The following 17 plants, 11 of which are now diagnosed for the first time are additions to the known flora of Burma detected at various times in determining collections from several sources.

Order—**MAGNOLIACEÆ.**

Manglietia Hookeri Cubitt et Smith, sp. nov.

Species *Manglietiæ insigni* et *M. Caveanæ* affinis; foliis longioribus angustioribus, fructibus fere globosis, carpellorum dorso lœvi nec lenticellato, sinu traverso longo angusto distinguenda est. Proxima est *Manglietia insignis* var. *angustifolia* ex montibus Khasianis et Assam, cujus flos fructusque ignoti.

Arbor magna; innovationes cinereo-pubescentes. *Folia* coriacea, lanceolata vel oblongo-lanceolata vel elliptica, acuta vel breviter acuminata, basi cuneata, glabra, utrinque nitentia, nervis 20-28 paribus, 20-30 cm. longa, 6-8 cm. lata; petioli 2-3 cm. longi glabri. *Flores* solitarii 10 cm. diametientes; gemmæ cylindrico-ovoideæ, 5-6 cm. longæ; bractea spathacea glabra. *Sepala* tria oblonga obtusa. *Petala* 8-9 alba. *Fructus* ovoideus, fere globosus, 7 cm. longus, 6 cm. latus; carpella 1-4-seminifera; semina 10-11 mm. × 5-6 mm.

Sinlum and other stations in the Bhamo division of Upper Burma at an elevation of 5-6,000 ft., Nos. 20, 302^A, 327, *Cubitt!* Mogok, Burma 4,000 ft., No. 314 *Rodger!*

A tall evergreen tree with narrow conical crown; yields valuable timber which is much prized by the Kachins of Upper Burma. The wood is used for house-posts and is said to be very durable. The Kachin name is Măgri-lăkung. Its nearest ally is apparently *Manglietia insignis* H. f. & T. var. *angustifolia* from Assam and the Khasia hills; but as no flower or fruit of the latter has ever been secured, it is impossible to say anything definite about that variety. The leaves of *M. Hookeri* are very coriaceous, shining on both upper and lower surfaces, the lower being somewhat paler, both showing minute but very distinct reticulations; the nerves in 20-28 pairs, not much more prominent than the secondary nerves. The flowers are solitary and terminal, when fully opened 10 cm. in diameter; sepals greenish below, cream-coloured above; the petals white, the outer larger than the sepals; the column of ovaries exceeds the stamens. The ripe fruit is almost globose, rounded at the apex and very stout; in shape and size very like that of *Anona squamosa*; the individual carpels are much compressed laterally; external surface diamond-shaped; short blunt beaks; external measurement 2 cm. × 2 cm. taken from mesial carpels; dehiscing dorsally; the line of dehiscence is marked at a very early stage (long before maturity) by a deep but narrow sinus extending the whole length of the carpel; nothing of this kind is seen in the fruits of its two nearest allies; the dorsal surface of the carpel is smooth and shows none of the lenticular markings of *M. insignis* and *M. Caveana*. The number of seeds in each carpel is variable, sometimes one, more frequently two or three, occasionally four; ovules on an average six. The chief distinction between this species and its congeners lies in the fruit which differs in size and shape and in the form of the individual carpels.

ORDER—**ANONACEÆ.**

Melodorum minuticalyx MacGregor et Smith, sp. nov.

Species *Melodoro verrucoso* H. f. & T. affinis; sed floribus fasciculatis, calyce minutiore distinguenda.

Frutex scandens; rami juniores minute rufo-tomentosi, mox glabrescentes, lenticellati. *Folia* usque ad 15 cm. longa, ad 6 cm. lata, coriacea, oblonga, acuta, vix vel breviter acuminata, basi rotundata, 1-1·5 cm. petiolata; lamina supra minute reticulata, glabra, costa rufo-pubescente excepta, infra minute molliterque tomentosa, nervis 14-18 paribus. *Flores* 1·2 cm. longi (gemmæ pyramidales), 4-12 aggregati; ramulus contractus, 3-4 mm. longus, folio-oppositus vel non, (flores terminales non vidi); pedicelli 1·5-2 cm. longi, minute tomentosi, 1-2 bracteolis 1 mm. longis ovatis prope basin instructi. *Sepala* 2-3 mm. longa, ovata, triangularia, basi connata. *Petala exteriora* 1·2 cm. longa, flava, suaveolentia, coriacea, ovato-lanceolata, extus minute rufo-tomentosa, intus pubescentia; *petala interiora* extus pubescentia, intus glabra. *Stamina* multa, brevia. Ovaria ± 10, sericea, stigmate glabro. *Fructus* ignotus.

West of Keng-Tung, Southern Shan States, Burma, at an elevation of 5,000 ft. No. 1294 *MacGregor!* Poneshee, Yunnan, China, *Anderson*! The latter sheet was collected in 1868 and matches the Shan State's specimen exactly. It was placed in the Calcutta Herbarium as *M. verrucosum?* and is probably the one referred to in King's Anonaceæ, (Ann. Bot. Gard. Calc. Vol. IV. p. 135) where Yunnan is given as a locality for *M. verrucosum*.

ORDER—TERNSTRŒMIACEÆ.

Sladenia celastrifolia Kurz.

Taunggyi, S. Shan States, 4,700 ft., Nos. 223, 246, ***Watson***! Distribution—China.

ORDER—SAPINDACEÆ.

Paranephelium hystrix W. W. Smith, sp. nov.

Species *Paranephelio macrophyllo* King affinis, longis angustis foliolis integris statim distincta; fructus echinatus.

Arbor magna. *Folia* imparipinnata, alterna, exstipulata; rhachis 20-30 cm. longus; foliola opposita, 9-11, 25-40 cm. longa, 9-12 cm. lata, lanceolata vel oblongo-lanceolata, breviter acuminata, integra, glabra, utrinque lucidula, ad 1 cm. petiolulata, nervis 15-18 paribus subtus eminentibus; petiolus petiolulique ad basin tumidi. *Paniculæ* ramosæ, e trunco nascentes, fasciculatæ, pubescentes. *Flores* 1-2 mm. pedicellati, polygami. *Calyx* 3 mm. diametiens, tomentosellus, in quinque lobos ovatos partitus. *Petala* 5, sepalis minora, æqualia, parva, tomentosella, scutiformibus squamis instructa. *Discus* patelliformis, membranaceus, integer. *Stamina* 6-8, filamentis subulatis glabris brevibus; antheræ ovoideæ, basifixæ, extrorsum dehiscentes. *Ovarium* rubro-pilosum; fructus lignosus, grosse echinatus, imperfecte 3-locularis ad 2 cm. diametiens; semen unum.

Shweli River Valley, Ruby Mines Division, Burma, No. 4 *Rodger!* At an elevation of 1,000 ft. Bhamo Forest Division, No. 638 *Cubitt!* Myitkyina, Burma, 1,000-1,500 feet, No. 5177 *Lace!* Also leaf specimens collected by Anderson in 1875 marked "Yunnan Expedition," possibly of Burmese origin. Our herbarium material is scanty and further observations are desirable regarding size of tree, character of the wood, structure and variation in the flower. The tree flowers in April.

ORDER—SIMARUBACEÆ.

Irvingia Oliveri Pierre.

Thaton District, Burma, *Lace* Nos. 4835 ! 4836 ! An important timber tree of great height. Burmese name is *Thaung thayet*. It is found frequently in Cochin China. Incomplete specimens from the Malay Peninsula (not taken up in the " Materials for a Malayan Flora ") appear to be the same. The genus is in the Flora of British India ascribed to *Simarubaceæ* but its affinities seem to be with *Anacardiaceæ*. *Vide* Pierre " Flore Forestière de la Cochin Chine," plate 263 and accompanying text.

ORDER—ROSACEÆ.

Prunus macrophyllus Sieb. & Zucc.

Burma; Myitkyina District, elevation 500-800 ft. Nos. 7, 40, 72 *Buchanan !* below Bhamo, 400 ft. No. 347A *Cubitt !* The Kachin name of this tree is *Prankinsa* ; Burmese, *Tankyat*. Distribution :—Japan and China.

ORDER—ERICACEÆ.

Craibiodendron W. W. Smith. Genus novum.

Ex affinitate *Lyoniae* et *Pieridis*. *Calyx* liber, 5-partitus, segmentis ovatis in alabastro apertis basi paululum imbricatis, post anthesin immutatus, persistens. *Corolla* breviter campanulata, subcoriacea, 5-dentata, lobis erectis. *Stamina* 10, inclusa, filamentis liberis geniculatim flexis, apice sed aliter quam in *Pieridibus* : antheræ dorso muticæ. *Ovarium* globosum, apice intrusum, 5-loculare ; stylus columnaris, stigmate truncato ; ovula in loculis mediocriter numerosa, placentis axi loculi infra apicem affixis inserta. *Capsula* depresso-globosa, 5-loba, 5-locularis valvis medio septiferis ab axi valido persistente placentifero solutis ; placentæ in fructu dehiscente induratæ, acuto-unguiformes. *Semina* pendula, pro ordine magna, ideoque pauca, unilateraliter alata.—*Arbor* parva, alternis foliis petiolatis subpersistentibus integris. *Flores* in racemos paniculatos terminales dispositi, breviter pedicellati, bracteati et 2-bracteolati. Species unica burmo-siamensis. In herbario Calcuttensi sub nomine nudo *Leucothoe Mannii* King et Prain, est specimen mancum

ex Assam (flores perjuvenes adsunt) quod non eadem species est sed fortasse ad idem genus ascribendum est.

Craibiodendron shanicum W. W. Smith, sp. nov.

Arbor parva, ramis ramulisque robustis glabris, ut videtur, habitu *Pieridi* similis. *Folia* alterna, 6-10 cm. longa, 3·5-4·5 cm. lata, elliptica, obtusa, basi subrotundata, apice rotundata, nonnunquam breviter emarginata, integra, crasse coriacea, glabra, infra multis sparsis glandulis nigrescentibus instructa, nervis 10-15-jugis fere horizontalibus utrinque distinctis infra prominulis intra marginem anastomosantibus distincte reticulatis, petiolo rugoso 7-10 mm. longo. *Racemi* in apice ramorum paniculati ad 20 cm. puberuli. *Flores* parvi, bractea et duabus bracteolis subulatis instructi. *Calyx* 1 mm. longus, puberulus, post anthesin immutatus, 5-partitus; sepala fere libera, perlate ovata, subapiculata. *Corolla* 3-4 mm. longa, 2-3 mm. lata, subcoriacea, puberula, in lobos erectos triangulares nec imbricatos ad tertiam fissa. *Stamina* 10, inclusa, corollæ fere æquilonga, libera, filamentis minute puberulis medio conspicue incurvis basi latiusculis complanatis sed ad 5 mm. triente summo filiformibus; antheræ basi subsaccatæ, dorso muticæ, in tubulos 2 integros rimis anticis elongatis dehiscentes productæ. *Ovarium* ± 1 mm. longum, superius 5-loculare, furfuraceo-pubescens, nitidum, stylo 2 mm. longo columnari; in loculis magna placenta pendula. *Fructus* capsularis, depresso-globosus, 9-10 mm. longus, 11-12 mm. latus, profunde 5-angulatus, 5-locularis; semina in loculo quoque 4-7, compressa, a vertice disposita paginarum more, 1-2 mm. longa, sed cum ala 5 mm. longa, 3 mm. lata; testa alaque chartacea rugosulo-striata.

Burma:—near Loimwe, Southern Shan States, No. 726 *MacGregor!* at Taunggyi, No. 234 *Watson!* Maymyo 3,500 ft., Nos. 3125, 4160 *Lace!* Siam:—Nos. 1282, 1282 *A. Kerr* in Kew Herbarium.

The generic name is in honour of Mr. W. G. Craib of the Royal Gardens, Kew, who noticed the plant among Siamese collections, and to whom I am indebted for comparing my material at Kew and for his opinion on the validity of the genus. I take this opportunity of recording my obligations to him for the prompt and most valuable help and criticism he has given in regard to most of the new species published. Previous to obtaining fruit I had placed the plant doubtfully in *Pieris*; and it appears as *Pieris ? shanica* in letters to corres-

pondents who have communicated the specimens quoted above. The tree flowers in August when the leaves are hard and coriaceous. The fruit ripens in April (*Lace* No. 3128) when the young leaves appear, the older ones being apparently shed at some time in the cold season.

ORDER—PRIMULACEÆ.

Primula obconica Hance.

Shan States, at 6,000 ft., *Phillimore!* Distribution :—Western China and Tibet.

ORDER—APOCYNACEÆ.

Beaumontia brevituba MacGregor et Smith, sp. nov.

Species *Beaumontiæ khasianæ* Hook. f. affinis; corollæ lobis tubo multo majoribus, stylo piloso distinguenda est.

Frutex alte scandens. *Folia* ad 25 cm. longa, ad 13 cm. lata, elliptica, breviter acuminata, integra, supra glabra, infra molliter pilosula, nervis 12-14 paribus. *Flores* in cymas laxas pilosulas dispositi. *Calyx* ad 1 cm. longus, in 5 lobos ovatos pilosulos partitus. *Corollæ* albæ infra tomentosæ supra glabrioris tubus cum faucibus ampliatis 1-2 cm. longus, 4-7 mm. latus, nunquam *B. grandifloræ* similis infra attenuatus; lobi ad 3-5 cm. longi, ad 2·5 cm. lati, obovati. *Stamina* summo tubo affixa, ad medios corollæ lobos eminentia; antheræ sagittatæ, breviter acuminatæ, corneæ, conniventes, stigmatis medio adhærentes, loculis basi in appendiculas lineares incurvas productis; filamenta sparsis pilis instructa. *Stylus* filiformis, undique pilosus. *Fructus* deest.

Kiu Long, West Keng-Tung, Southern Shan States, at an elevation of 5,000 ft., No. 1286 *MacGregor!* A species remarkable for the size of the corolla lobes in proportion to the tube.

ORDER—GESNERACEÆ.

Phyllobæa sinensis Oliver.

Gokteik Gorge, 1,500 ft., No. 4158 *Lace!* near Maymyo, No. 57 *Badal Khan!* Distribution—Central China.

Didymocarpus bracteatus MacGregor et Smith, sp. nov.

Species *Eudidymocarpi* sectionis, prope *D. platycalycem* Clarke, bracteis magnis rotundis, calyce magno ampliato conspicua.

Caulis ad 20 cm. altus, 1 mm. crassus, paucis sparsis capillis. *Folia* opposita petiolata ; nodi 2-3 ; petiolus 1-4 cm.; lamina 3-5 cm. longa, 2·5-4 cm. lata, ovata, inæqualiter cordata, serrata, acuta, supra subscabra, subtus, venulis exceptis, glabra, subglauca. *Pedunculi* 1-2, ad 5 cm. longi, glabri ; *pedicelli* ± 1 cm. longi, 3-4-umbellati, interdum statim flores gerentes, interdum iterum 3-4-divisi ; *bracteæ* magnæ, ad 1 cm. longæ, fere orbiculares, plus minus cohærentes, involucrum formantes. *Calyx* ± 1 cm. longus, 4 mm. latus, tubulosus, 5-dentatus lobis 2 mm. longis obtusis, glaber. *Corolla* 3-3·5 cm. longa, punicea, fere bilabiata, tubo ad 3 cm. longo elongato superne ampliato basi 2 mm. apice 7 mm. lato. *Stamina* duo, medio tubo affixa; antheris cohærentibus, filamentis flexuosis. *Discus* parvus, cupulatus. *Stylus* brevis, stigmate parum dilatato subintegro. *Fructus* immaturus 3 cm. longus.

On rocks near Loi Mwe, S. Shan States, Burma, No. 715 *MacGregor !* Elevation 4,500 ft. Flowers in August.

Didymocarpus graciliflorus MacGregor et Smith, sp. nov.

Species sectionis *Eudidymocarpi ; Didymocarpi Mortoni* Clarke affinis ; sed corollæ tubo multo longiore, ore minus inflato, fructu stipitato distinguenda.

Rhizoma breve. *Caulis* 12-16 cm. longus, erectus, habitu robusto, rufo-villosus. *Folia* 4-5 paria, valde inæqualia, ad 12 cm. longa, ad 5·5 cm. lata, ovata vel elliptica, subobtusa, serrata, petiolata, molliter hispidula, infra nervis exceptis glabriora ; petiolus ·5-2 cm. longus. *Flores* paniculatæ axillares et subterminales ; pedunculi ad 10 cm. longi, hispiduli, supra ramosi ; bracteæ discretæ, ovatæ, 3-6 mm. longæ, rufo-villosæ ; pedicelli 4-nati, 2 interni florigerentes, 5-6 mm. longi, 2 externi longiores iterum divisi. *Calyx* 4-5 mm. longus, subglaber, verruculosus, in quinque lobos oblongos obtusos fere ad imum partitus. *Corollæ* purpureæ tubus ad 1·8 cm. longus, gracilis, supra vix dilatatus ; limbus patens, lobis orbicularibus, superioribus breviusculis, inferioribus ad 5 mm. longioribus. *Stamina* duo, filamentis glabris ; staminodia duo linearia. *Capsula* immatura 1 cm. longa, ad 6 mm. stipitata, glanduloso-pilosula, stylo 3 mm. longo.

Common on rocks at Loi Mwe, Keng Tung, Southern Shan States, at an elevation of 4,500 ft., No. 714 *McGregor !* Flowers in August.

ORDER—BIGNONIACEÆ.

Stereospermum grandiflorum Cubitt et Smith, sp. nov.

Ab omnibus *Stereospermis* 1-pinnatifoliatis indicis et burmanicis maximo flore ad 5·5 cm. longo statim distinctum est.

Arboris descriptio deest. *Folia* imparipinnata, rhachide 16-18 cm. longo pilosulo, foliolis 7 late ellipticis breviter obtuse acuminatis basi rotundatis integris subsessilibus glabris nisi in nervis 6-9 paribus pilosulis. *Flores* in paniculas laxas terminales dispositi. *Calyx* ad 1·7 cm. longus, ad 1 cm. latus, ovoideus, junior clausus, per anthesin breviter inæqualiterque lobatus, coriaceus, glaber. *Corollæ* (flavæ ?) tubus 3-4 cm. longus, superne ampliatus, puberulus ; limbus patens ad 4·5 cm. diametiens, lobis omnibus rotundatis subintegris. *Stamina* 4. *Capsula* immatura, sessilis, elongata ad 30 cm., 4 mm. lata, compressa, falcata.

Low lying areas in the Bhamo division, Burma ; No. 234 *Cubitt !* A description of the tree and of the mature fruit has yet to be obtained.

Nyctocalos shanica MacGregor et Smith, sp. nov.

Species *Nyctocalo brunfelsiæflori* T. et B. affinis ; corollæ tubo minore sed latiore supra inflato, filamentis omnino glabris distinguenda est.

Frutex alte scandens, glaber, ramis verrucellosis cinerascentibus. *Folia* opposita, 3-foliolata, foliolis ad 12 cm. longis 6 cm. latis ellipticis acuminatis integerrimis, nervis 6-8 paribus ; petiolus 4-5 cm. longus ; petioluli 1-4 cm. longi. *Flores* 4-7 ad apicem unius vel duorum pedunculorum terminalium subcorymbose dispositi, pedicellati ; pedicelli 1 cm. longi. *Calyx* 7-8 mm. longus, 4-5 mm. latus, campanulatus, truncatus, æqualiter 5-dentatus ; dentes 1 mm. longi, filiformes. *Corollæ* albæ tubus mediocriter pro genere longus (5-6 cm.), cylindraceus, supra in fauces campanulatos sensim ampliatus (non abrupte ut apud congeneres) ; limbus æqualiter divisus in lobos quinque 1-1·5 cm. longos ovatos obtusos, apiculo nullo. *Stamina* 5, duo minora, omnia pollinifera, medio tubo inserta, tubum æquantia ; antheræ glabræ loculis oblongis subparallelis. *Ovarium* gynophoro brevissimo ; stylus filiformis, bilamellato stigmate ; capsula seminaque non visa.

East of Keng-Tung, Southern Shan States, Upper Burma, at an elevation of 1,000 ft., No. 672 *MacGregor !* A new species more

closely connected with those of the Malayan Archipelago than with *Nyctocalos Thomsoni* Hook. f.,—the only representative of the genus within the Indian boundary. Flowers in July.

ORDER—**ORCHIDACEÆ.**

Eulophia sp. aff. **flavæ** Hook. f.

Species *E. flavæ* valde affinis, fortasse varietas.

Southern Shan States, at 3,000 ft. *Phillimore !* Flowers in May before the leaves appear. Not quite matched in either the Kew or the Calcutta Herbarium, but coming very near to *Eulophia flava* Hook. f. The flowers are a little larger with the mid-lobe of the lip suborbicular and traversed by five ridges. The plant is possibly scarcely distinct specifically, and may be merely a variety of that species which ranges from the West Himalaya to Nepal, and is also recorded from Travancore and Hong-Kong.

Ione salweenensis Phillimore et Smith, sp. nov.

Species *I. paleaceæ* Lindl. et *I. virenti* Lindl. affinis; petalis orbicularibus distinguenda.

Rhizoma repens. *Pseudobulbi* 1-1·2 cm. longi, ovoidei, læves, virides. *Folia* 6-9 cm. longa, 1 cm. lata, linearia, obtusa, ecarinata, nervis multis parvis, breviter bifida, breviter basi canaliculata. *Scapus* 7-10 cm. longus, gracilis; spica 4-6 cm. longa, floribus 3-6, bracteis ·6-1·3 cm. longis erectis lanceolatis acutis concavis membranaceis. *Flores* erecti, pedicello cum ovario 1 cm. longo. *Sepala* æqualia 1·1-1·2 cm. longa; posticum lanceolatum, acutum, quinque purpureis lineis notatum; lateralia in laminam albam translucentem septem purpureis lineis traversam labello suppositam apice 2-dentatam connata. *Petala* ±4 mm. longa, fere orbicularia, integra, lineis obscuris tribus vel nullis. *Labellum* sepalis fere æquilongum, ovatum, brevissime unguiculatum, carnosum, purpureum, marginibus erosis, disco bicarinato, carinis per laminam currentibus et in apicem labelli obtusam incrassatamque desinentibus. Columna brevis, apice biaristata. Pollinia 4. Mense martio floret.

Salween valley, Shan States, Burma, at an elevation of 5,000 feet, *Wood ! Phillimore !*

Stauropsis shanica Phillimore et Smith, sp. nov.

Species *S. undulatæ* Benth. valde affinis; sed caulibus gracilioribus non-verruculosis, floribus majoribus, sepalis petalisque obtusis distincta.

Caulis 60-90 cm. longus, flexuosus, lævis, pendens, gracilis. *Folia* ad 10 cm. longa, 1·5 cm. lata, loriformia, apice inæqualiter et obtuse biloba, sinu basi cuspidato, coriacea, non-recurvata, paululum carinata. *Scapus* erectus, racemo terminali paucifloro, bracteis 7-8 mm. longis ovato-lanceolatis. *Flores* albi roseo-suffusi. *Sepala* et *petala* 2·5 cm. longa, ·5 cm. lata, subconsimilia, oblonga, obtusa, undulata. *Labellum* sepalis brevius, carnosum, hypochilio lobis rubris columnæ non adnatis instructo, epichilio a latere compresso purpureo.

East of Salween river, Southern Shan States, Burma, at an elevation of 7,000 feet, collected by Captain R. H. Phillimore R.E.

The *stems* are two to three feet long, drooping, of the thickness of a goosequill, flexuous, smooth, without the warts which characterize its ally *S. undulata*. The *leaves* are strap-shaped, very slightly keeled, unequally and obtusely bifid, usually 3 inches long by ½ inch wide. *Peduncle* about 8 inches, with a raceme of 6-8 inches; pedicel with ovary about 1 inch. *Flowers* 2 inches across, sepals and petals wide-spreading, except the lateral sepals which hang contiguous below the lip, all oblong obtuse not fleshy and fading rapidly, somewhat waved, white tinged and veined with rosy-pink. Tips of sepals inflexed, especially the laterals which are slightly the wider. Whole lip fleshy, with side lobes reddish, brown veined; upper surface of long mid-lobe purple, rising to a sharp callus and terminating in a blunt knob. *Column* short, contiguous to the side-lobes of the lip but not adnate; anther 2-lobed. The species comes very near to *S. undulata*.

FOUR NEW SPECIES OF THE COMPOSITÆ FROM SOUTH INDIA AND A *JUSTICIA* FROM ASSAM.

By W. W. Smith.

Vernonia Meeboldii W. W. Smith, sp. nov.

Species ex affinitate *Vernoniæ Gardneri* Thw. et *V. Thwaitesii* Clarke; foliis obovatis integris inter alia facile distincta.

Caulis erectus, e radice lignosa simplex, cum inflorescentia 30-40 cm. altus, robustus, strictus, striatus, fere glaber, inflorescentia terminali 15-20 cm. longa. *Folia* radicalia 1-2; caulina 4-5, subsimilia, 6-8 cm. longa, 1·5-2·5 cm. lata, obovata vel oblanceolata, apice rotundata apiculata, vel superiora bracteiformia rarius acuta vel acuminata, basi in petiolum latum amplexicaulem subauriculatum sensim attenuata, crassa, coriacea, integra vel rarius ad apicem remote indistincte serrata, glabra, nervis indistinctis 2-3 paribus. *Inflorescentia* reliquum caulem æquans, depauperatis corymbis remote racemosa; corymbi 1-3-capituliferi, axillares in foliaceis bracteis pedunculo sub-æquilongis. *Capitula* pedunculata, pedunculis 1-3 cm. longis inter majora. 1-1·5 cm. diametientia, (in uno specimine abnormali 7 mm.,) 30-40-flora. *Phyllaria* ± 4 mm. longa, multiseriata, exteriora breviora, anguste oblonga, apice triangulari, extra ± puberula, intra glabra, interiora omnino glabra. *Antheræ* paulum basi elongatæ. *Pappus* rufus 6 mm. longus, corollam glabram æquans, sine serie exteriore. *Achenium* 2·5 mm. longum. 10-costatum, glabrum. *Receptaculum* marginibus areolarum conspicue eminentibus ornatum.

Peninsular India :—Travancore, No. 13001 *Meebold!*

Vernonia comorinensis W. W. Smith, sp. nov.

Species *V. Wightianæ* Arn. affinis; sed foliis lanceolatis, phyllariis pubescentibus, corolla glabra, pappo diverso distinguitur.

Planta in scheda 'parva arbor' descripta. *Caulis* (apex rami florentis adest) angulatus, albo-tomentosus. *Folia* 8-10 cm. longa, 1·5-2 cm. lata, ± 5 mm. petiolata, lanceolata, acuta, basi cuneata, crenulata, supra impresse reticulata, parce minute puberula, infra dense lanato-tomentosa. *Corymbi* terminales lati; rami 5-8 cm. longi, paucis foliis linearibus instructi. *Capitula* mediocria pedunculata, pedunculis 5-20 mm. longis, 12 mm. longa, 8 mm. lata, phyllariis inferioribus 5-7 lineari-oblongis 4 mm. longis lanato-tomentosis, intermediis ovatis apiculatis pubescentibus, superioribus oblongis 7-8 mm. longis glabris vel apice pilosulis. *Corolla* 5-6 mm. longa, glabra. *Achenium* 4-5-costatum, compressum, glabrum, 4 mm. longum, anguste cuneatum. *Pappus* stramineus; in serie exteriori paleæ ± 12, oblongæ, 1-2 mm. longæ, apice serratæ, persistentes; in serie interiori parca setæ sæpius 5-6, 5-7 mm. longæ, fragiles, caducæ.

Peninsular India :—S. Tinnevelly. There is only one sheet in the Calcutta Herbarium on which is written "Vernonia salviæfolia, S. Tinnevelly. A small tree." There is no collector's name.

Anaphalis travancorica W. W. Smith, sp. nov.

Inter species asiaticas *Anaphalidi Thwaitesii* Clarke ex Zeylania proxima; foliis caulinis longioribus in formam teretem revolutis, et phyllariis diversa; ab *A. oblonga* D.C. claro majoribus capitulis facile distincta.

Habitus omnino *Anaphalidis Thwaitesii*. *Caulis* infra suffrutescens, 30-40 cm. altus, e basi in 2-5 ramos erectos divisus, foliis dense approximatis plus minus deflexis tectus. Rami floriferi ± 4 mm. diametientes, simplices, foliis parum vel vix imbricatis, dense albo-tomentosi, apice corymbosi. *Folia inferiora* oblonga vel oblongo-lanceolata, 3-4 cm. longa, 8-9 mm. lata, crassissima, subobtusa, sessilia, subadnata, utrinque albo-lanuginosa, marginibus revolutis, costa lata; *folia superiora* 2-3 cm. longa, 3-4 mm. lata, ita revoluta ut teretia videantur, adscendentia, etiam adpressa; cætera inferioribus similia. *Capitula* majuscula in 5-6 glomerulos 2-3 cm. diametientes corymbose compacta, cuique glomerulo 7-8 arcte agglomerata, plus minus 1 cm. diametientia. *Phyllaria* alba, nitentia, 4-5 mm. longa, limbo ovato multum reflexo. *Flores* 3 mm. longi, acheniis immaturis 3 mm. longis squamellosis, lepidibus minutis.

Peninsular India: at Devicolam, Travancore, alt. 7000 ft., No. 13328 *Meebold!* High Range, Travancore, No. 36 *Bourdillon!*

Anaphalis Meeboldii W. W. Smith, sp. nov.

Species affinis *Anaphalidi brevifoliæ* D.C. et *A. neelgerrianæ* D.C.; foliis caulinis æqualiter distributis, minutis phyllariis vix 2·5 mm. longis distincta. Habitu *A. contortæ* Hook. f. conformis; sed caules numerosiores, strictiores, magis compacti.

Caulis infra suffruticulosus, 20-30 cm. altus, ex basi in 10-20 ramos erectos divisus. Rami floriferi ± 1 mm. diametientes, simplices vel ramosi, foliis æqualiter distributis, nec ut in *A. brevifolia* et *A. neelgerriana* apice laxioribus, deflexis nisi apice, ad summum tecti, albo-tomentosi, glomerulo compacto capitulorum terminati. *Folia* 6-9 mm. longa, 1 mm. lata, linearia, subobtusa, sessilia, subadnata, utrinque albo-lanuginosa, involuta. *Capitula* inter minores in unum glomerulum 1·5 cm. diametientem ad 30 compacta, 3-4 mm. diametientia. *Phyllaria* 2·5 mm. longa, albido-flava, limbo orbiculari 1 mm. longo. *Flores* 2 mm. longi.

Peninsular India :—Travancore, No. 13326 *Meebold !*

Justicia Craibii W. W. Smith, sp. nov.

Species sectioni *Calophanoidei* et *Justiciæ Neesianæ* Wall. affinis; sed foliis longioribus angustissimis, bracteis linearibus, segmentis calycis longioribus distinguitur.

Herba parva, glabra. *Radix* perennis, lignosus. *Caulis* 20-40 cm. altus; internodii 1-2 cm. longi, 4-6-lineati; dimidium caulis inferius foliis expers. *Folia* bis-vel ter-verticillata, linearia, vix petiolata, ad basin attenuata, ad 6 cm. longa, 3 mm. lata, apice obtusa, costa subalbida. *Flores* solitarii vel 2 vel 3 in axillis superioribus, sessiles, in 4-8 verticillos compositi; bracteæ foliis persimiles, 1 cm. longæ, glabræ; bracteolæ minutæ subulatæ. *Calyx* 5-partitus, lobis subulatis ad 1 cm. longis. *Corolla* paulum calycem superans, bilabiata, labio superiore breviter bifido, inferiore laciniis æqualibus trifido; tubus limbum æquans; color ignota. *Stamina* duo; antheræ cellula inferior albo-caudata. *Fructus* 5 mm. longus, quatuor seminibus subtuberculosis.

Haflong, North Cachar Hills, Assam, No. 463 *Craib !*

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RECORDS
OF THE
BOTANICAL SURVEY OF INDIA

VOLUME IV.—No. 6

DETERMINATIONS OF THE PRICKLY PEARS NOW WILD IN INDIA

BY

I. H. BURKILL

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DETERMINATIONS OF THE PRICKLY PEARS NOW WILD IN INDIA.

By

I. H. Burkill.

Prickly pears are American plants of the genus *Opuntia.* Five of them are known to me as now wild in India, *viz.:*—

Opuntia cochinelifera, Mill.,
Opuntia monacantha, Haw.,
Opuntia elatior, Mill.,
Opuntia nigricans, Haw., and
Opuntia Dillenii, Haw.

It is possible to regard *Opuntia nigricans* as only a variety of *Opuntia elatior.* Further, there is one columnar Cactus,—

Cereus pterogonus, Lemaire.

All these plants belong to the natural order Cactaceæ.

Cacti are so difficult to determine properly that no paper on them should be published without such references as may indicate to the reader how the specific names have been used in it: the required references are given in this paper towards the end (p. 315).

Being of a curious appearance such as to excite interest, and being very easily propagated from the joints, and very tenacious of life, Cacti were early brought from America to gardens in Europe, and thence taken to various parts of the world, where different species have thriven as in India. The following are the results of this carrying about the world.

Central Europe contains *Opuntia nana,* Vis. (called by many authors *O. vulgaris*), which had its original home in Central America. The footnote below[1] gives a digression on the reason for discarding the name " vulgaris " in favour of " nana."

---

[1] Miller founded *Opuntia vulgaris* on the figure of a plant given by Johann Bauhin in his *Historia plantarum universalis,* (1656), p. 154: and this figure is a reduction of an older one given by Lobel in his *Icones,* ii, (1591), p. 241. Having

The Mediterranean littoral of France, Italy and Sicily are said to contain *Opuntia nana*, *Opuntia Ficus-indica* of Gussone and most later authors, *Opuntia Dillenii*, *Opuntia inermis*, DC., and *Opuntia amyclæa*, Ten. A footnote[2] below shows how ill-used has been the name "Ficus-indica," and that *Opuntia decumana* is commonly indicated by it.

Opuntia decumana, Haw., is cultivated in Malta, and in other places.

---

founded the species, Miller put under it plants which grew wild on roadsides in Italy, about Naples, in Sicily and in Spain, and which would stand exposure to the open air in sheltered corners in England. It may be that Miller had confused two unlike plants together ; but it is beyond doubt that the *Opuntia* now established in Switzerland, the Tyrol, Northern Italy and elsewhere is not the plant figured first by Lobel and then by Johann Bauhin, to which the name "vulgaris" belongs, although it may have been included in the second part of Miller's *Opuntia vulgaris* : therefore it is safer and wiser to use Visiani's name "nana" for this plant.

On the ground that the figure shows one thorn the suggestion may be made that it was *Opuntia monacantha* which these old authors figured. Further *Opuntia monacantha* was undoubtedly in cultivation from about their times; under the figure in the Kew copy of Lobel's *Icones* some old hand has written "commonly grows in gentlemen's gardens in England"; and there is preserved at the British Museum of Natural History, South Kensington, an undoubted example of *Opuntia monacantha* from the garden of Mary, Duchess of Somerset, who lived from about 1630 to 1714. I believe that the origin of *O. vulgaris* is *O. monacantha;* but I strongly deprecate any change of name in consequence.

[2] The *Opuntia Ficus-indica* of most authors can hardly refer to any other plant than *Opuntia decumana ;* it certainly is not Miller's plant, nor is it Linnæus'.

The name "Ficus-indica" was devised by Miller for the second of the species in Tournefort's *Institutiones Rei Herbariæ*, i, (1719), p. 239, which was a plant in cultivation in the Royal Gardens, Paris, in 1665. Miller having founded the species put under it something that he knew as growing in Jamaica,—"the most common sort in Jamaica, and upon the fruit wild cochineal feeds," having stars of long bristly thorns and bright yellow flowers and a purple spiny fruit which, eaten, colours the urine bloody. If we cannot ascertain for certain what was the species named by Tournefort "Opuntia folio oblongo media" [and this is only possible if an adequate specimen can be found in Tournefort's herbarium at the Jardin des plantes, Paris], then we may take Miller's most common Jamaican plant as the type of *Opuntia Ficus-indica.*

Karl Schumann in his *Verbreitung der Cactaceæ* (Anhang zu den Abhandlungen der Königl. Preuss. Akad. der Wissenschaften zu Berlin vom Jahre 1899), p. 30, says that *Opuntia Tuna* is the commonest of the species in the West Indies ; but turning to his *Gesamtbeschreibung der Kacteen*, (1899), p. 723, we find that he cannot have had a clear idea of what *Opuntia Tuna* is ; for he cites as illustrations of it (1) a figure in the *Botanic Register* (plate 255), which is certainly of *Opuntia Dillenii*, and (2) a figure in DeCandolle's *Plantes Grasses* (plate 137), which is very probably of *Opuntia tomentosa* (*vide* Berger in the *Monatschrift für Kacteenkunde*, Spain contains *Opuntia decumana,* and apparently *Opuntia nana* also (*vide* Boissier, *Voyage dans le Midi d'Espagne,* i, 1839, p. 25).

Opuntia leptocaulis, DC., is said by Karl Schumann, *Verbreitung der Cactaceæ,* p. 34, frequently to run wild in Europe.

North Africa contains *Opuntia decumana* [3] and *Opuntia nana.*

1905, p. 132). But again Urban in his *Symbolæ Antillanæ,* iv, (1910), p. 433, gives a very general distribution for *Opuntia Tuna* in the West Indies. As a study of the West Indian Cacti is being made by Dr. N. L. Britton, of the New York Botanic Garden, we hope for further light from that quarter.

Linnæus founded his *Cactus Ficus-indicus* in the *Species Plantarum,* i, (1753), p. 468, on a plant which he had observed growing in the garden of George Clifford (*Hortus Cliffortianus,* 1737, p. 183) and defined as "Cactus compressus articulis ramosus, articulis ovatis oblongis, spinis subulatis," and on the third, not on the second, species of Tournefort's list, *viz.,* "*Opuntia major* validissimis spinis munita," and also on Sir Hans Sloane's plant "folio spinis longis et validissimis confertim nascentibus obsito."

Now the "Opuntia Ficus-indica" of the writers on the Mediterranean flora is something which has not the stars of long strong thorns. It is a plant 8—12 feet high, with very short deciduous thorns hardly longer than the glochidia, with yellow flowers, producing in its garden races fruits, in one race blood-red, in another race yellow, in a third race white, and with a fourth race seedless. Gussone in his *Prodromus Floræ Siculæ,* i, (1827), p. 559, called that plant *Cactus Opuntia :* and Tenore in his *Flora Napolitana,* iv, (1830), p. 270, called it *Opuntia vulgaris.* But Gussone in his later *Floræ Siculæ Synopsis,* (1842), p. 549, changed its name to *Opuntia Ficus-indica.* This name has persisted. All these writers evidently refer to the edible *Opuntia decumana* which is now commonly cultivated on the Riviera, in Italy, Sicily, Malta and elsewhere. There is a figure of *Opuntia decumana* in Griffiths' paper on the *Spineless Prickly Pears* in the United States Department of Agriculture, Bureau of Plant Industry, Bulletin No. 140, (1909), plate 1, fig. 2.

Gussone has a var. b. of his "Opuntia Ficus-indica" which he describes as possessing a single thorn about twice as long as the glochidia. To this he refers Lobel's figure. The variety is named in both his works referred to, and is what Pojero in his *Flora Sicula,* i, pt. 2, (1891), p. 239, also defines as *Opuntia Ficus-indica.* Perhaps this variety, with one spine elongated, leads up to the *Opuntia amyclæa* of Tenore which Berger in the *Gardeners' Chronicle,* series 3, xxxiv, (1903), p. 93, says is only *Opuntia Ficus-indica* run wild and become more thorny.

Opuntia amyclæa as figured by Tenore (*Flora Napolitana,* Atlas v, 1838, plate 236), has an orange flower ; but that circumstance would not separate it from *Opuntia decumana,* which typically is yellow flowered : because *O. decumana* varies in regard to the colour of its flower. Labouret, *Monographie de la famille des Cactacées* (1850), p. 474, notices the variability in colour.

[3] Steinheil (*vide* Boissier, *loc. cit.*) thinks that the Moors, when they were driven out of Spain by Phillip III, being almost all cultivators, must have taken with them an Opuntia from Spain ; and though from the way in which he writes it seems as if *Opuntia nana* were the plant referred to, it would assuredly be *Opuntia decumana.* For a reference to *Opuntia decumana* in Algiers see Holmes' *Museum Report, Pharmaceutical Society of Great Britain,* for 1895—1902, (1903), p. 24.

One Opuntia has reached Palestine.

The Canaries according to Lowe (*Manual Flora of Madeira,* 1868 p. 317) contain *Opuntia Dillenii* and *Opuntia Tuna,* Mill. : and according to Pilard and Proust (*Les Iles Canaries,* Paris, 1909, p. 197) *O. Ficus-indica* is in the islands. Possibly Pilard and Proust mean *O. decumana,* or possibly something else. It is not clear whether *Opuntia brasiliensis,* Haw., is wild in the Canaries or not; for Lowe who in the *Botanic Magazine,* (1868), under plate 3293, said that it had been introduced into those islands in his time, does not state anything about the mode of its occurrence there. Among the four species which my sister detected in Gran Canary is either *O. monacantha* or *O. brasiliensis.* I have a plant in cultivation; but it is at present too young for determination. I have seen undoubted specimens of *Opuntia Dillenii* from the Canaries —my sister informs me that about Las Palmas it abounds—, and also specimens of *Opuntia decumana.*

Madeira contains, according to Lowe, *Opuntia Tuna* which rarely in that island sports in producing plants with flowers, which, instead of being dull red in colour, are of a clear bright yellow, *i.e.,* it approaches *O. Dillenii.*

The Cape contains *Opuntia monacantha, Opuntia decumana,* perhaps *Opuntia triacantha,* DC., and possibly *Opuntia elatior,* or if not a very kindred species. Oldenburg collected the first named at the Cape in 1772.

Karl Schumann says, in his *Verbreitung der Cactaceæ,* p. 30, that *Opuntia Tuna* is wild in Namaland; but then it is uncertain what his "O. Tuna" was.

Mauritius contains *Opuntia monacantha,* and possibly also *Opuntia decumana.*

Madagascar contains *Opuntia monacantha.*

Zanzibar possesses *Opuntia monacantha.*

The Red Sea coast possesses *Opuntia decumana.*

Java contains *Opuntia elatior:* and *Opuntia Dillenii* is recorded for it.

Blanco's words (*Flora de Filipinas,* 1837, p. 414) "con grupos de cerdas tiesas, de las cuales una dos son mas largas" seem to indicate that an *Opuntia* like *Opuntia Dillenii* was in the Philippines when he wrote.

Loureiro (*Flora Cochinchinensis,* 1790, p. 306) records a "Cactus Ficus-indica" for Cochinchina, which may have been *Opuntia monacantha.*[4]

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[4] The evidence that Loureiro's Cochinchina plant was *Opuntia monacantha* rests on his remark that he had also seen it in Bengal and elsewhere in India; and what he saw in Bengal must have been *Opuntia monacantha.* It is very weak evidence however

Tabular statement of the distribution here given.

	Central Europe.	S. France, Italy, Sicily.	Spain, Algeria.	Canaries, Madeira.	S. Africa.	Mauritius, Madagascar, Zanzibar.	Red Sea Coast.	India.	Malay Islands.	China, Cochin-china.	Hawaii.	Australia.
Opantia												
amyclæa		×										
brasiliensis				?								×
cochinelifera								×				
decumana		×	×	×	×	?	×					
Dillenii		×		×				×	×	?		
elatior					?			×	×			×
inermis		×										
leptocaulis		?										
monacantha				?	×	×		×		?		×
nana	×	×	×									
nigricans								×				
stricta												×
tomentosa											?	
triacantha					?							
Tuna				×	?						?	

Australia contains *Opuntia monacantha,* Haw., *Opuntia stricta,* Haw., *Opuntia brasiliensis,* Haw., and apparently *Opuntia elatior,* which Maiden calls " Opuntia Tuna " (*vide* Maiden, *A Preliminary Study of the Prickly Pears naturalised in New South Wales,* Department of Agriculture, Sydney, Misc. Publ. No. 253, 1898).

China possesses one Opuntia. Hance called it *Opuntia Dillenii* (in *Journ. Linn. Soc. Bot.,* xiii, 1873, p. 104), and rightly, if the black thorns on the only specimen which I have seen, have gone black from yellow as a post-mortem effect (see p. 299). The Chinese use it for preventing the desecration of their graves by jackals and also for hedges (vide *Bretschneider, History of European Botanical Discoveries in China,* 1898, p. 770).

The Sandwich Islands possess two Opuntias : Hildebrand (*Flora of the Hawaiian Islands,* 1888, p. 140) calls one *Opuntia Tuna,* and describes it as if rightly so named : the other he thinks may be *Opuntia tomentosa,* Salm-Dyck.

It will have been noticed that *Opuntia monacantha* has become the most widely distributed of all the Cacti, and that *Opuntia decumana* and *Opuntia Tuna* are second and third to it. Griffiths (in Bull. No. 140, U. S. Dept. Agric., Bureau of Plant Industry, p. 8) points out that spineless *Opuntia decumana* was not necessarily produced in the Mediterranean by cultivation, but may have been found by the Spaniards in the New World in a state not very inferior to its present garden condition in Europe.

OCCURRENCE OF OPUNTIAS IN INDIA.

Ten years of personal observation enable me to record as follows the distribution in India of the species named in the first paragraph :—

Opuntia cochinelifera : —An uncommon species. **Punjab.**—Hoshiárpur. **United Provinces** :—Mainpuri district, locality not recorded. **Bengal** :—Arrah. **Bombay** :—Very sparingly at Dhárwár ; possibly at Poona. **Madras** :—Presumedly at Karanguli in the district of Chingleput in 1878 (Shortt); formerly, if not still, at Courtallam in the Tinnevelli district (G. Thomson). **Burma** :—Near Taungtha in the Myingyan district ; at Myittha ; in some abundance about Kawkareik in the Amherst district.

Opuntia monacantha : —Is very widely distributed, but for the most part not found in great abundance. **Punjab** :—At Jhelum before 1867 (Aitchison) ; Lahore ; Amritsar ; Kangra ; Jullundur and Ludhiana, formerly in abundance ; Patiála ; Ambála ; Isrána near Pánipat ; Bámla ; Rohtak ; Hissar ; Simla hills, at Kákarhatti, Dharmpur, between Erki and Namoli, and at Suket, reaching 4,000 ft. at the latter place; in Bashahr (Lace no. 1100). **United Provinces**:—Almora district, formerly; Agra; Cawnpur; Dehra Dun; Gorakhpur (R. St. G. Burke). **Bengal**:—On the Kumta river near Jáinagar in the district of Darbhanga; Muzafferpur; Sirseah near Muzafferpur; Sámástipur; Dalsing Sarái; Bahárdurganj, Málingaon and Garbandanga in the north of the Purneah district; Purneah; Kishenganj, plentiful; Parbatipur; Bárh; common between Barákar and Gáya in 1856 (Kurz); east of Pitoria in the district of Ránchi (Wood); Sagardighi and Barala in the district of Murshedabad; north of Banpur in the Nadia district; near Calcutta at Konnagar, Chinsurah, Hughli and Tollyganj; in Orissa near Cuttack and at Jájpur. **Eastern Bengal**:—Rámpur-Boália; Rangpur; Pátgrám in the district of Rangpur; Serájganj; Jagannáthganj; Gáuripur in the district of Mymensingh; Dacca; Chittagong. **Assam**:—Goálpara; Gáuhati; Shillong at 4,800 ft.; Russi, between Shillong and Jowai; Tezpur; Bishnáth; Jamuna Mukh in the Nowgong district (Gill); Melang in the district of Sibságar (Watt). **Central Provinces**:—Musra in the State of Khairagarh; at Bhandára road station, near Khat and Tumsar road station in the district of Bhandára. **Rajputana**:—Sanganir near Jáipur; perhaps also at Alwar. **Nizam's Dominions**:—Degaon near Bháisa. **Madras**:—Formerly very general (see p. 302): near Madras; formerly, if not still, at Coimbatore; in the Circars the only Cactus about Parlakimedi; and at Gopálpur (Prain), Hospet and Penuchonda (Cox). **Burma**:—Akyab; sparingly; in "Pegu" in the time of Kurz; in the dry central region at Sidoktáyá in the district of Minbu (Aubert and Gage), Salé, Yamethin, Kyaukse, Bilin, Singaing, Samon railway station, Mandalay; Sagaing to Shwebo along the railway, Pakan-nge in the Pakokku district; Wabo, Tandow and Myinmu in the Sagaing district; at Bhamo (G. W. Dawson); in the Shan hills at Hsipaw; and Fort Stedman (Abdul Huq.)

Opuntia nigricans:—Has only been seen on the railway embankment a few miles from Bankipur towards Gáya. However it is so very like the next that it may have been overlooked elsewhere.

Opuntia elatior:—Is exceedingly common in India. **Punjab**:—Exceedingly common about Delhi; beyond Delhi about the villages of Bámla, Kálánáur and Chiráua between Hissár and Pánipat; Kángra, **United Provinces**:—Very general, but replaced by *Opuntia Dillenii* near Agra and to the south-east. **Bengal**:—Exceedingly common in the Arrah and Patna districts; associated with *Opuntia monacantha* at Purneah, Calcutta; very plentiful in Orissa. **Central Provinces**:—At Nágpur and places to the west of Nágpur; Amráoti; Ellichpur; Khandwá; Asirgáon. **Rajputana**:—At Kishongarh near Jáipur. **Bombay**:—Plentiful in Gujarát about Ahmedabád, and in the Káira district at Nariad and Boriávi; Baroda; Surat; about Bombay; in the Tápti valley at Nándurbár; at Poona, practically the only Cactus present; presumedly the Cactus found at Karla (Gammie), and at Satara (Gammie), and at Jambusar (Gammie); very plentiful at Dhárwár. **Nizam's Dominions**:—Common about Hyderabád. **Madras**:—Belláry, in association with the next; about the town of Madras; very plentiful all down the Circars from the Orissa border to Bezwáda.

On the railway line embankments about Bárh in Behár I have found a plant with nearly seedless fruits, analogous to the seedless forms of *Opuntia decumana*.

Opuntia Dillenii:—Is the common Cactus of the south of India, where it often makes great thickets around villages: it is less common in the north of India. **United Provinces**:—About Saháranpur; north of Agra about Chata; and at Gorakhpur (Harsukh 21388); east of Cawnpur along the East Indian Railway and general through Allahabad and Mirzapur. **Bengal**:—Arrah; Dumraon; rare about Bankipur; Patna; along the railway line between Patna and Barh; Kotalpakur in the Sonthal Perganas; Rániganj in the Bardwán district; Goghát in the Hughli district (Hossein) and near Calcutta. **Nizam's Dominions**:—Plentifully about Hyderabád, Warangal and Kázipet. **Madras**:—All along the east coast, often within reach of salt spray,[5] or on the very edge of salt pans in the districts of Gánjam and Vizágápatám, Bezwada and at Madras; inland in the direction of Parlakimedi only as far as Tekkali, and there obviously recently planted; very common around the villages near Belláry; sent to me by Mr. J. W. Mollison from the Nellore district. **Mysore**:—Formerly, if not still (see p. 301). **Coorg**:—Formerly, if not still, at Mercara (Hohenacker).

Cereus pterogonus:—The columnar Cactus.—**Bengal**:—Common about Purneah; Dumraon; Goghát in the Hughli district (Hossein); and very common at Mihijan in the Sonthal Perganahs; Rániganj in the Bardwán district; and in Orissa. **Eastern Bengal**:—Serajganj; Dacca. **Burma**:—Akyab (Townsend); Yamethin (Rigg); Toungoo

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[5] It is interesting in this connection to note Thiery de Menonville's remark (*Traité de la Culture du Nopal*, 1787, p. 274), "Une espèce est le tuna de Dillenius; c'est celle . . . que les colons de Saint Domingue appelle raquette des bords du mer." This raquette of the sea shore, if not *Opuntia Dillenii*, is some near ally.

(Parsons); common about Bilin, Singaing and Kyaukse; Bhamo (Dawson); Taunggyi (Scott).

VERNACULAR NAMES.

Opuntias do not possess distinctive names in the languages of India, but are collectively known as Nágphani all over Northern India. In Southern India they are called Naga Kulli, Naga Dali Kulli or Naga Mulli or Chuppattu Mulli—the adjective meaning flat. The Burmese class them with other succulents under the name Shazaung, distinguishing *Opuntia monacantha* as Shazaung letwa (hand-like) or Shazaung kya-sha. Cereus is called in Burma Shazaung-kha or Shazaung pyat-that.

HISTORY OF THEIR INTRODUCTION AND SPREAD.

No records exist to show when the first Opuntia reached India; but it must have been a considerable time before 1800 A.D. It is narrated that sailing boats carried the stems to serve as vegetables at a time when anything green, not actually poisonous, although unpleasant to eat, was used to prevent scurvy. By reason of that use, Opuntias may have found their way into India. But at any rate, when at the end of the eighteenth century the East India Company tried energetically to establish a cochineal industry, certain species were not wanting in India to serve experimentally as food plants for the insect; for there is evidence that at the time Bengal contained one species, and there is reason to believe that Southern India contained two. Other species were then introduced into cultivation in India, chiefly by the efforts of Dr. James Anderson in Madras and Dr. William Roxburgh in Calcutta.

James Anderson had commenced to take an interest in cochineal at least as early as 1786; and when in 1788 the East India Company gave sealed orders to the Captains of some of their ships proceeding to the Brazils to procure the insect, if possible, he was allowed to plant a garden of Opuntias for its receipt. Anderson's garden seems, at any rate at first, to have been planted up chiefly with an Opuntia procured from His Majesty's garden at Kew through Sir Joseph Banks, and considered there to be the true Nopal on which the Cochineal insect feeds. That Opuntia was propagated by Dr. Anderson and his assistant Dr. Andrew Berry, until they had a garden of two thousand plants; and then it was distributed to Bengal and also to St. Helena in order that a stock of it might be ready against the receipt of the insect (see Spry in *Trans. Agri-Hort. Soc. India*, vi, 1839, Appendix, p. 26). The garden also contained an Opuntia received from Mexico *viâ* Manila, and one from China (*vide* Prinsep in the same place, p. 85). Again Anderson brought at least one other Opuntia into his garden.

The garden existed for twenty years, and perhaps more; Röttler who visited it in 1807 was able to dry specimens taken thence of four Opuntias which are now preserved in the Herbarium of the Royal Botanic Gardens, Kew. I find these to be:—*Opuntia monacantha, Opuntia elatior, Opuntia cochinelifera*, and a black-thorned plant which, so far as the specimen preserved at Kew goes, does not differ otherwise from *Opuntia Dillenii* and is probably it. This last Röttler called *Cactus Tuna.*

Possibly Anderson grew even more than these four;—at least such action would be in accord with his enthusiasm; but there is no evidence that he did so. Without doubt the plant received from Kew was *Opuntia cochinelifera;* those from Mexico *viâ* Manila and China cannot be identified.

While Anderson's garden was in existence William Roxburgh was busily bringing together into the newly founded [6] Calcutta Botanic Gardens a collection of living Cacti. One species, as said, Roxburgh had found established near Calcutta; and he gave to it the name *Cactus indicus,* and wrote of it in his *Flora Indica,* published in 1832 but written before 1815 (ii, pp. 475), " found here and there on road sides, in forests and among bushes in the neighbourhood of Calcutta; and I am informed that it is equally common not only over the whole province, but also on most of the adjoining districts; " he brought it into cultivation in the Botanic Garden at Shibpur; he brought also into his collection an Opuntia from China which he named *Cactus chinensis,* and others as follows:—three received from William Hamilton, a correspondent who sent him many things, chiefly American, which three he enumerated as *Cactus Opuntia, Cactus Ficus-indica* and *Cactus Tuna major,* and two received from Dr. J. Anderson, *viz., Cactus coccinellifer* and *Cactus Tuna elatior.* He had received the *Cactus Opuntia* in 1798, and he received the *Cactus Tuna elatior* in 1801; the dates of the receipts of the others are not recorded by Roxburgh, but we may assign the receipt of the *Cactus coccinellifer* from Anderson to the year 1788 or 1789. My identifications of the species grown by Roxburgh and Anderson and comments on the identifications will now be given seriatim.

Opuntia cochinelifera:—Undoubtedly Roxburgh and Anderson both cultivated the true *Opuntia cochinelifera.* Roxburgh received his plant from Anderson, and Anderson gave the specimen to Röttler which is preserved at Kew, with the label "Cactus coccinellifer. Ex. horto Andersoniano. Madras, April, 1809." The specimen is undoubtedly what it claims to be: and again a drawing left by Roxburgh unquestionably represents this species. Anderson had received his two original living plants from the Royal Gardens at Kew.

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[6] Founded in 1787.

Opuntia monacantha:—Undoubtedly both grew *Opuntia monacantha*. A drawing in Roxburgh's collection proves that he had it, and Röttler preserved a specimen from Anderson's garden with the label "Cactus silvester, nob. Caulib. erectis, articulato-proliferis, articul. obovat., compress., lucido-viridibus. Spinis setac. subsolitariis, apicibus fuscis. Corollis patentibus. Pistillo staminibus longiore. Fructu viridi. Pabulum coccinellarum sylvaticarum. Ex horto Anderson. April 19, 1809." *Opuntia monacantha* was the prickly pear on which Roxburgh grew the cochineal insect; and certainly when he sent the insect to Anderson he must have sent branches of the plant also; so that Anderson could grow it then, if he wished, and had not (but I believe that he had) got plantations of it already. Roxburgh figured this prickly pear, with the cochineal insect on it: and the description of his *Cactus indicus* demonstrates conclusively that *Opuntia monacantha* is what he called by that name.

The Chinese Opuntia—apparently O. decumana:—Of Roxburgh's *Cactus chinensis* a figure was left by him. It is of a thornless lanceolate-ovate joint with a pale salmon-pink flower springing from near the base; some of the petals are notched in the centre at the top and all are slightly serrated on the upper margin; the stamens and style nearly equal them. Mr. N. E. Brown thinks that the drawing may be identified as representing *Opuntia decumana* and apparently correctly, for though the shape of the joint would be unusual on a well rooted plant, it is just such as arises first on a cutting in Calcutta. Wallich in a Manuscript Catalogue of the Botanic Garden at Shibpur says that William Beale sent the same species to him in 1839.

Opuntia elatior:—Undoubtedly Anderson grew *Opuntia elatior*. Röttler's specimen tells us so: it is labelled "Cactus Ficus-indica. Caulibus erectis, articulis obovatis compressis glaucis. Spinis setaceis congestis divaricatis. Corollarum petalis coarctatis, rubescente flavis. Pistillo filamentis breviore. Fructu rubro. A coccinellis sylvaticis hæc species non comeditur. Ex horto Andersoniano. April 19, 1809."

Roxburgh's "Cactus Ficus-indica" probably the same as Aiton's:—Roxburgh grew a "Cactus Ficus-indica." There is no proof that it was the same as Anderson's, which has just been mentioned. It has given me the greatest trouble to find means of identifying the plant; but I observe how largely Roxburgh relied on Aiton's *Hortus Kewensis* for his names; and I find in that work, ii, (1789), p. 153, a "Cactus Ficus-indica" called the "White-spined Indian Fig." Roxburgh has left a drawing of a white-spined Opuntia with a sulphur-yellow flower lined outside with red, and with a blood red fruit. Voigt, who from the records of the Calcutta Botanic Garden compiled his *Hortus Suburbanus Calcuttensis* (published posthumously in 1845), says, p. 63, that "Opuntia Ficus-indica" had a large sulphur flower produced in the rainy season. It is quite possible that this was Roxburgh's *Cactus Ficus-indica.* The drawing does not represent a plant which otherwise I know. Roxburgh, as noted on p. 297, received his plant from William Hamilton, and not from Anderson.

Of the two Tunas of Roxburgh's Catalogue, Tuna elatior was probably Opuntia elatior:—For the determination of the other species of Opuntia that Roxburgh and Anderson grew, the evidence is very unsatisfactory. Three names remain in Roxburgh's catalogue, *viz.*, *Cactus Opuntia*, *Cactus Tuna major*, and *Cactus Tuna elatior*; and one further specimen was preserved by Röttler from Anderson's garden, with the label "Cactus Tuna. Ex horto Andersoniano. April 19, 1809."

It is evident that Roxburgh intended by the names *Cactus Tuna major* and *Cactus Tuna elatior* to indicate that he identified his two plants with the *Cactus Tuna*, *α. Tuna major*, and *β. Tuna elatior*, of Aiton's *Hortus Kewensis*, (1789), p. 154, *i.e.*, with two of Dillen's species. As a matter of fact Dillen's full names (*Hortus Elthamensis*, 1732, pp. 395—398) were three, *viz.*:—

Fig. 382. Tuna major, spinis validis flavicantibus, flore sulphureo.
Fig. 380. Tuna major, spinis validis flavicantibus, flore gilvo.
Fig. 379. Tuna elatior, spinis validis nigricantibus.

The three names indicated as many different plants, which were cultivated in Sherrard's garden at Eltham in Kent, between 1724 and 1732, *i.e.*, sixty-five to eighty years before Roxburgh and Anderson were experimentally growing Opuntias in India. But Aiton put the two first together as *Cactus Tuna major*.

Regarding *Cactus Tuna elatior*, it is to be noted that Anderson sent the plant to Roxburgh which Roxburgh so named, and that he did not send it until 1801. I know of no evidence whence he got it: and I think that Roxburgh probably gave to it the name as it stands in his *Hortus Bengalensis,* identifying it with the *Tuna elatior spinis valadis nigricantibus* of Sherrard's garden which is what we now know as *Opuntia elatior.* Voigt tells us that *Opuntia elatior* of the Calcutta gardens had a purplish-yellow flower : this if it may be regarded, and I think it may, as a very loose substitute for the splendidly accurate " rubescente flavus " that we have seen on the label of Röttler's specimen of *Opuntia elatior,* supports the contention that Roxburgh's *Opuntia Tuna elatior* is the plant which Anderson, as represented by Röttler's herbarium, had as *Cactus Ficus-indica.* The conclusion then is that Anderson obtained the plant, and Roxburgh receiving it from Anderson identified it as *Cactus Tuna elatior* and grew it as such at Calcutta ; but that Röttler, from whatever source we do not know, gave it the name of *Cactus Ficus-indica* in his herbarium.

Is not Anderson's Opuntia Tuna, Opuntia Dillenii ?—In 1902 I collected and dried some specimens of undoubted *Opuntia Dillenii* at Vizagapatam. During the nine years that I have kept them, their yellow thorns have darkened considerably. This observation makes it seem probable that Röttler's *Cactus Tuna* which differs in appearance from *O. Dillenii* in nothing but the colour of the thorns is a specimen of *Opuntia Dillenii* the thorns of which have gone black through age ; indeed if the thorns of *Opuntia Dillenii* blacken completely, then certainly it is *Opuntia Dillenii.* It is not a species which Anderson is recorded as sending to Roxburgh.

Roxburgh's second Tuna may have been true Opuntia Tuna :—For identifying Roxburgh's *Cactus Tuna maior,* we turn to Dillen's two figures ; one of them may represent *Opuntia Dillenii* and the other *Opuntia Tuna.* Voigt in his *Hortus Suburbanus Calcuttensis* recorded an " Opuntia Tuna " with a reddish flower as being in the Calcutta gardens. If this was Roxburgh's plant then he may have had the true *Opuntia Tuna.*

Roxburgh's Cactus Opuntia cannot be determined :—Roxburgh's *Cactus Opuntia* by its name ought to have been *Opuntia nana, i.e.,* the *Opuntia vulgaris* of most authors (for which see the note on p. 287) ; but I have no means of proving this. Voigt compiling thirty years later recorded *Opuntia vulgaris* as being in the Calcutta garden, but not flowering.

The Manila Opuntia :—The Opuntia introduced from Manila, which has no place in the *Hortus Bengalensis,* but is mentioned in the

Asiatic Register and elsewhere, as one which the wild cochineal would eat, cannot be identified.

From the above remarks it may be concluded that of the five Opuntias now wild in India—

Opuntia cochinelifera was introduced by Anderson from Kew who communicated it to Roxburgh :

Opuntia monacantha was in India long before Roxburgh's time :

Opuntia elatior was probably introduced by Anderson who sent it to Roxburgh :

Opuntia nigricans cannot be recognised among the species known to Roxburgh and Anderson :

Opuntia Dillenii probably was the "Cactus Tuna" of which Anderson gave a specimen to Röttler. Even if it were not, there is, however, evidence to follow that *Opuntia Dillenii* was in southern India before either of these two men lived in it.

It has been said that *Opuntia monacantha* must have been introduced long before Roxburgh's time ; the evidence for this statement lies in the already wide distribution that Roxburgh records for it. Again it has been recorded (p. 290) that Loureiro (*Flora Cochinchinensis*, 1790, p. 306) saw an Opuntia, presumedly this one, in Bengal and other places in India ; he called it *Cactus Ficus-indica.* Buchanan-Hamilton, a contemporary of Roxburgh's, left behind him two drawings of *Opuntia monacantha ;* the sheet whereon is the one, is labelled "Cactus cochineliferus, Lin. drawn by ——— in 1809" and the sheet whereon is the other, is labelled "Cactus coccinelifer : Lin. Sp. pl." The second figure shows the plant thornless, and the red bracts which subtend the clusters of glochidia and thorns are carelessly put in ; but nevertheless it is an undoubted figure of *Opuntia monacantha.* It is not stated by Buchanan-Hamilton where it grew, but he was surveying in the district of Rangpur in the early part of 1809, and in the district of Purneah in the end of that year. He recorded that in the district of Dinájpur were hedges of Opuntia (Montgomery Martin, *History, Antiquities, and Statistics of Eastern India*, ii, 1838, p. 902).

Immediately after the reception of the wild cochineal in Calcutta one nopalry[7] at any rate was planted in Bengal : Sir George Watt (*Commercial Products of India*, 1908, p. 347) has called attention to a plantation of 50 bighas having been prepared at Rishra near Calcutta, and advertised as ready for the insect on November 10th, 1796.[8] *Opuntia monacantha* must have been the species, or one of the species planted at Rishra: it is locally very prevalent at the present date.

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[7] Nopalry—a plantation of Nopal, *i.e.*, *Opuntia* for raising cochineal.

Next will be given the evidence that two species of Opuntia were not uncommon in the south of India about this time.

Small enclosures, bounded by hedges of Euphorbia and Opuntia, are named by Wilks in his *Historical Sketches of the South of India,* iii, (1817), p. 84, as having caused the entanglement of Tippoo Sultan's horse in the battle of Poongar on the banks of the Cáveri on September 12th, 1790. Then on p. 89, Wilks continues, "ascribing this disappointment chiefly to the enclosures, which we have mentioned, he (Tippoo Sultan) some years afterwards [9] ordered them to be entirely levelled over the whole face of the district, and it is a curious fact that he was materially aided in this operation by an almost invisible agent. The prickly pear or straight-thorned Opuntia (foot-note, *Cactus Ficus-indica,* Lin. Ainslie) is the chief material of these fences, and the Silvester cochineal introduced into Coromandel shortly after the order had been given devoured not only the leaves but the root of the plant with such avidity, as nearly to have terminated its existence in the south-eastern provinces: while the Cactus 'Tuna' or awl-thorned Opuntia remained untouched by the insect." We ask ourselves what these two Opuntias were.

Roxburgh and Anderson experimenting with the wild cochineal, obtained by Captain Neilson, had found that it would not feed on *Opuntia elatior*, but grew on *Opuntia monacantha.* This observation puts two names forward as possibly the two plants indicated by Wilks: and that the plant destroyed by the insect was *Opuntia monacantha* there is every reason to believe: but it seems questionable if the plant spared was *Opuntia elatior.* It will have been noticed that Wilks refers to

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[8] This is how the original advertisement runs as quoted in Seton Karr's *Selections from the Calcutta Gazettes* (Calcutta, ii, 1865, p. 602): "The 10th November, 1796.

Advertisement. To be sold, that pleasant and well known villa of Rissurah ... .. at the convenient distance of about ten miles from Calcutta ....To the premises are attached ... about one hundred and twenty bighas of Napaulry, fully planted and now ready to receive the insect, which renders it a valuable estate, and which will, in all probability, pay in the first year a considerable part of the purchase money that will be required for it. For further particulars, enquire," etc.

[9] The inferior, sylvester or wild cochineal was introduced into Calcutta in 1795, through the agency of a Captain Neilson whose ship had touched at Rio de Janeiro on its way to India, and was distributed to Madras a few months afterwards. This circumstance would indicate that Tippoo Sultan's order was issued about 1795.

Ainslie as his authority for the names. Ainslie in his *Materia Medica of Hindustan,* (1813), p. 91, catalogues two Opuntias as having vernacular names and uses in Southern India, *viz., Cactus Ficus-indica,* the straight-thorned Opuntia and *Cactus Tuna,* the awl-thorned Opuntia. The contrast in the English names must be noted ; for in it is the strongest evidence that *Opuntia Dillenii* was the awl-thorned Opuntia or "Cactus Tuna," *Opuntia elatior* being straight-thorned like *Opuntia monacantha.*

When Captain Neilson's race of the cochineal insect had reached Madras in 1795, and was known from the Bengal experiments as well as from experiments made by Dr. Andrew Berry to grow freely on an Opuntia plentiful in the country side, but not well or not better on their imported Opuntias, the Collectors of Revenue of that Presidency were each supplied with a small quantity of the insect and directed, in orders dated 29th March 1796, to exert themselves in the most strenuous manner to get it propagated, and for its maintenance they were to enclose spots of ground fifty or sixty feet square here and there in convenient villages. The Opuntia in the orders is described as the Naga kulli or Naga dalli kulli to be found in clumps and in hedges of native gardens. Next they were instructed to offer a price for the produce to induce villagers to collect and prepare the insects. By their collecting, 4,393 lbs. were sent to London in 1797, and 36,388 lbs. in 1798 (H. G. Prinsep in *Transactions, Agri-Horticultural Society of India,* vi, 1839, Appendix, p. 89). The spread of the insect was thus most rapid,—an observation which to us is important as demonstrating the abundance of the Opuntia it fed on, at any rate in the country near Madras.

Buchanan-Hamilton tells us in his *Journey from Madras through Mysore* (1807), that in 1800 and 1801 the hedges of that part of the country were chiefly made of *Euphorbia Tirucalli,* Linn., and *Euphorbia Antiquorum,* Linn. ; but it appears that at intervals there occurred hedges of Opuntias. On pp. 399—400 he states that when on May 13th, 1801, he reached Beiluru, about forty miles north of Seringapatam, he found the cochineal collecting in progress. Two men were there, agents of an officer in Arcot, who had apparently brought the cochineal insect with them, and buying the right of putting it on to the hedges of the gardens, were then busy collecting the crop that had resulted. The Opuntias were dying from the attack of the insects ; and when all the hedges were dead, the two men said that they would " carry two men's loads of branches filled with the insect, and apply these to the Nopals (*i.e.*, Opuntias) of some other place." Then the ryots of Beiluru would plant new hedges of Opuntia ; and Buchanan-Hamilton estimated that after three years these would be strong enough to bear another crop, whereupon other gatherers of cochineal could come and buy the rights. His last remark is most interesting ; he says "the cochineal is the bad kind that has lately been introduced into India, and the plant is the Cactus that is aboriginal of the country." It has already been remarked that Roxburgh thought *Opuntia monacantha* to be aboriginal of India ; and there is no doubt that Buchanan-Hamilton meant the same species.

Seringapatam had fallen in 1799 ; Tippoo Sultan's orders to destroy the hedges in his State had been issued about 1795 ; the cochineal insect had been introduced into Coromandel in 1795 or 1796 and in 1801 was being carried by cochineal collectors through the countryside of Central Mysore. Thus Wilks and Ainslie show to us that there were two Opuntias then wild in Southern India, which we have identified as *Opuntia monacantha* and *Opuntia Dillenii*,—the first evidently the more general. No wide distribution of *Opuntia Dillenii* could have taken place since Anderson commenced his experiments, especially as *Opuntia Dillenii* would not obtain any rapid dispersal by the cochineal collectors to whom it was useless ; the conclusion therefrom is that *Opuntia Dillenii* had been established in Southern India with *Opuntia monacantha* well before the end of the eighteenth century.

From reports made on the cochineal raised in India, it appeared that at least four times as much was required to give the same colour as the best Mexican grana fina. Therefore those interested in India were not satisfied ; and the result of their dissatisfaction was the importation of other supplies of the insect and of other Opuntias. Further the price obtained dropped to one-third of what it had been, making the purchase unremunerative and compelling the Government to discontinue their policy, which they did gradually, taking only 8,000 lbs. in 1809 and 4,000 lbs. in 1810.

Before the East India Company had commenced their experiments, the French had sent Thierry de Menonville, the King's Botanist at Saint Domingo, to Mexico to obtain the cochineal insect for the French West Indies. Thierry de Menonville at the risk of being sent to the galleys,—for the Spanish had imposed such a penalty on helping other countries to raise cochineal,— succeeding in getting together a good deal of information about its cultivation in Mexico and in bringing living Opuntias and living insects to Saint Domingo where they were established until the political troubles of the French Revolution caused their loss (see the *Botanical Magazine*, 1872, under plate 2742). In his *Traité de la culture du nopal*, published posthumously in 1787, p. 284, Thierry de Menonville says that the wild cochineal would grow on the Nopal of Castille, on the true Nopal of the gardens of Mexico, on the Spanish raquette, on Nopal sylvester, on the Opuntia of Campeche, on Pereschia and on the Tuna of the sea shore, growing best on the first and worst on the last; but it was inconvenient on account of the many thorns to use Nopal sylvester, Pereschia and the Tuna of the sea shore for it. The fine cochineal would grow well on the Nopal of Castille, the Opuntia of Campeche, and on the true Nopal of the gardens of Mexico, which three had been imported into Saint Domingo from Mexico. The Nepal of Castille, the true Nopal of Mexican gardens, the Spanish raquette and the Opuntia of Campeche were plants comparatively thornless.

India possessed in cultivation, at the time of which I am writing, one thornless Nopal, the "Kew Cactus" of the correspondence of those years, Linnæus' *Cactus cochinelifera*, afterwards thought by Sir William Hooker to be the Opuntia of Campeche [see the *Botanical Magazine*, (1827), under plate 2742]. Did Röttler identify *Opuntia monacantha* with Nopal sylvester?

In 1807 the Board of Revenue, Madras, endorsed a suggestion that as the British Government had got possession of certain Spanish parts of South America, a reward should be offered for the bringing of the cultivated cochineal insect to India, *viâ* the Cape: and we learn from the record of this transaction that a Mr. William Webb had a nopalry containing in it "a few roots of the Kew nopal," *i.e.*, of *Opuntia cochinelifera*.

The expression and the context suggest that the Kew nopal, in spite of two thousand plants possessed by Drs. Anderson and Berry, had become rare ten years later.

In 1821 and again in 1822 G. A. Prinsep brought to Bombay, *viâ* Chelsea, cochineal insects from Campeche: it is not recorded on what Opuntia, but *O. cochinelifera* is probable (see *Trans. Agri.-Hort. Soc. India*, vi, 1839, Appendix, p. 30).

Lord Auckland again in 1836 introduced *Opuntia cochinelifera* from Kew, *teste* Wallich's Manuscript Catalogue of the Botanic Garden at Shibpur, Calcutta.

It is said that in 1820 Don Ildefonsa Ruez del Res imported the grana fina insect into Cadiz, Spain, where it was carefully cultivated by the Royal Economical Society of that city. Thence a clever Frenchman contrived secretly to bring away a supply of insects which gave rise to a stock in Bourbon in 1826. From Bourbon, Perottet was permitted to bring "some joints of Nopal strewed with cochineal" which he "preserved at Pondicherry until the third generation," when the "Nopals" died (see *Trans. Agri-Hort. Soc. India*, vi, 1839, Appendix, p. 31). The East India Company were slow in getting knowledge of the presence of the insect so near to India as Bourbon; but in 1837 Wallich became aware of it, and asked for a supply. A supply was sent which arrived in Calcutta in boxes wherein were "Nopals" and earth for their growth. At the same time a box of cochineal insects was sent on rooted Opuntias from the Cape. The Bourbon "Nopals" were so nearly dead on arrival that they were not propagated. The Cape plant is said (Bell in *Trans. Agri-Hort. Soc. India*, vi, 1839, Appendix, p. 36) to have been "Indicus," *i.e., Opuntia monacantha*. We have thus a possible second introduction of that species into India; but it is nowhere stated that these Cape plants were grown by the Agri-Horticultural Society.

Voigt, when he heard of the receipt in Calcutta of these insects, offered to supply from Serampur the following Cacti :—

"Opuntia Dillenii," meaning *O. monacantha*.
"Opuntia triacantha," a plant sent to Carey by Dr. Herbert.
"Opuntia cylindrica," a plant introduced into Calcutta in 1806.
"Opuntia cochinillifera"—*O. cochinelifera*.
"Opuntia Tuna," as we learn from the *Hortus Suburbanus Calcuttensis* the *O. Tuna major* of Roxburgh.
"Opuntia nigricans, Haworth," apparently the true plant.
"Cereus hexagonus, Haworth."

The list shows that he was cultivating or could lay his hands on (*i*) *Opuntia monacantha*, which had been in Bengal for a long time, (*ii*) on *Opuntia cochinelifera* which had been in Calcutta since about 1788, (*iii*) on the Opuntia which Roxburgh had grown as *Cactus Tuna major*, which may have been *Opuntia Tuna*, and had been introduced into India soon after *O. cochinelifera*, (*iv*) on *Opuntia cylindrica* which had come into India in 1806, (*v*) on *Opuntia triacantha* which must have come into India soon after and (*vi* and *vii*) on what he calls *Opuntia nigricans* (probably correctly) and *Opuntia ferox*,—introductions of about the same date. The list is interesting because it enables us to account for the appearance of *Opuntia nigricans* among the prickly pears now wild in India

The attempt to establish the grana fina cochineal having failed, the Agri-Horticultural Society set to work to be ready for a second importation and prepared a nopalry well stocked with the Bourbon Opuntia (*Trans. Agri-Hort. Soc.*, *India*, vii, 1840, p. 206).

More than forty years now followed before cochineal was again brought into public interest in India : then, in 1883, the Government of Madras reintroduced the insect from Algiers. The consignments were sent to Coimbatore on living Opuntias : but the insects died after arrival. The Cactus, it is stated, was grown successfully ; but the records do not give it a scientific name.

There have been no other attempts to establish Cacti in India except such as have been made in our Botanic Gardens for ornamental purposes only ; and those I do not need to touch on. All that need be given regarding introductions of these plants into the country has now been written ; and I pass on to evidence of the spread of them, correcting the nomenclature of books as I go. Writers have used the names with an almost constant wrongness, now in one way, now in another ; and every statement in the literature must be corrected in the matter of nomenclature before acceptance.

In 1834, Wight and Arnott (*Prodromus Floræ Peninsulæ Indiæ Orientalis*, p. 363) showed that they had identified *Opuntia Dillenii* correctly as occurring in Southern India : they, however, spoilt the recognition by confusing Roxburgh's *Cactus indicus* with it.

Voigt, as mentioned on page 305 above, wrongly called *O. monacantha* by the name of *O. Dillenii* (*Trans. Agri-Hort. Soc. India*, vi, 1838, Appendix, p. 32) showing that Wight and Arnott's mistake had reached Calcutta.

In 1839 J. Graham in his *Catalogue of the Plants growing in Bombay*, p. 83, recorded *Opuntia Dillenii* as "commonly used as a hedge plant about Cantonments in the Deccan." Almost certainly he referred to *Opuntia elatior*. He says that *Opuntia cochinelifera* was in Bombay gardens.

It is interesting to observe how the "thirties" brought the beginning of the present confusion in the nomenclature,—how Wight and Arnott having correctly named the southern *Opuntia* as *O. Dillenii*—(*Opuntia monacantha* had been swept out by the wild cochineal insect)—incorrectly put the northern *Opuntia monacantha* under it, and how Graham came after them putting the western *Opuntia elatior* under the same name.

Griffith recorded that the hedges about Ludhiána were in 1838 made of an Opuntia (vide *Posthumous Papers, Journals*, 1847, p. 313). This Opuntia probably was *Opuntia monacantha;* and we shall see that fifteen years later the cochineal insect had nearly wiped it out.

Taylor in his *Sketch of the Topography and Statistics of Dacca*, 1840, p. 57, writes of *Cactus indicus* evidently meaning *Opuntia monacantha.*

In 1844 Munro in his *Hortus Agrensis*, p. 19, recorded two Opuntias as occurring about Agra. The species which he calls *Opuntia cochinillifer* which "thrives very well in Agra: flowering in March" probably was *Opuntia monacantha ;* the other which he calls *Opuntia Dillenii* was "not common about Agra, but abundant round the villages near Bhurtpore." This second is probably a correct determination.

Voigt (*Hortus Suburbanus Calcuttensis*, 1845, p. 63) names *Opuntia cochinelifera* as being in the Honourable Company's Garden. Unlike the author just quoted, he, writing before 1841, indicated the true plant. He says that *Opuntia nigricans*, Haw., *Opuntia triacantha*, DC., *Opuntia rubescens*, Salm-Dyck, *Opuntia leucantha*, Hort. Berol, and *Opuntia vulgaris*, grew in the garden but did not flower; that *Opuntia Roxburghiana*, a new name for Roxburgh's *Cactus chinensis*, had only flowered once during twenty-years; that *Opuntia* (?) *spinosissima*, Haw., and *Opuntia brasiliensis*, DC., flowered, but did not fruit. He repeats his error of 1838 by recording *Opuntia monacantha* wrongly under the name *Opuntia Dillenii ;* and he records *Opuntia Tuna*, *Opuntia elatior* and *Opuntia Ficus-indica* as flowering, the first with a large reddish flower, the second with a large purplish yellow flower and the third with a large sulphur flower.

In 1848 (*Journ. Asiatic Soc. Bengal*, xvii, pt. 1, p. 583), Madden recorded the previous prevalence of *Cactus indicus* in Almora, and its destruction by the cochineal insect in 1846. He surely referred to *Opuntia monacantha.*

Wight gave a good figure of, and a correct name to, *Opuntia Dillenii* in his *Illustrations of Indian Botany*, ii, (1850), plate 114. He said on p. 48 that it was "apparently indigenous all over the country," but he added that, as it was never found far from habitations, it might, in his opinion, be possible that it had been brought from overseas.

Dalzell and Gibson (*Bombay Flora*, 1861, Supplement, p. 39) wrote that *Opuntia Dillenii* had become common at that time about the Deccan villages. The evidence of present distribution shows that they meant *Opuntia elatior*. It is most interesting to learn (p. 40) from them that according to report the plant had been brought to the Deccan by means of a few seeds that a Sirdar carried in his palanquin coming from Delhi. The Delhi Opuntia, as we have seen, is *Opuntia elatior*. Dalzell and Gibson add that in Gujarát it had only arrived to their knowledge at one place, the village of Sidhpur between Ahmedabád and Deesa.

Here may be given a reference of very considerable interest. George Gibberne writing in the *Transactions of the Agri-Horticultural Society of India*, v, 1839, Appendix, p. 11, mentions a Cactus as common in the Deccan and Khandesh, where it was overrunning every uncultivated and barren spot, and had cost some money and much trouble in a vain effort to eradicate it. Although he identifies it with an *Opuntia* on which the cochineal insect would live at the Cape, he must refer to *O. elatior*

Stewart relates (*Punjab Plants*, 1869, p. 101) that in 1844 an outbreak of the cochineal insect in the Punjab destroyed the Opuntia plants there. The outbreak was a matter of years and a Dr. A. Fleming recorded (in *Journ. Agri-Hort. Soc. India*, ix, 1857, p. 200) its existence at Amritsar in 1848. In the same year it was most prevalent at Ludhiána (Dempster in *Journ. Agri-Hort. Soc. India*, ix, 1857, p. 190). Stewart says that by 1852 only a single hedge remained at Ludhiána,—the place where Griffith had seen the Opuntia in 1838; in 1851 the cochineal insect was seen by Purdon west of Gujrát. Presumedly it persists still, for I saw it myself near Kángra in 1902. Stewart uses the name *Cactus indicus* for the plant, and indicates *Opuntia monacantha*.

Baden Powell (*Punjab Products*, 1872, p. 194) gives on the authority of a Mr. Taylor the statement that "Opuntia vulgaris," meaning *O. monacantha*, was wiped out in the neighbourhood of Ludhiána in 1849-50 and was, when he wrote, only to be found in small patches about Rahoon, Kartárpur and Kapurthála within that district.

Opuntia monacantha must have been exceedingly abundant in parts of the Punjáb. It had become a nuisance to such an extent in the Jullundur Doab that Shere Singh, when ruler of Lahore, inflicted fines on parties allowing it to extend (F. C. Burnett in *Journ. Agri-Hort. Soc. India*, vii, 1850, p. 32). But one year of the invasion of the wild cochineal destroyed it about Jullundur almost to a plant, and afforded the Kashmiri dyers a large supply of dye.

In 1875 Kurz, in his *Preliminary Report on the Forest and other vegetation of Pegu,* Appendix C, p. x, recorded as Burmese *Opuntia cochinillifera* and *Opuntia Dillenii*: it is impossible to be sure how he used the names; but as *Opuntia cochinelifera* and *Opuntia monacantha* are in Burma now, he probably indicated them.

In 1878 in the *Indian Forester,* iii, p. 233, Surgeon-Major J. Shortt wrote of a red-flowered spineless "Opuntia delenii" as common at Karanguli in the district of Chingleput. He evidently indicated *Opuntia cochinelifera.* He adds that this "Opuntia was introduced by the late Dr. James Anderson to feed the cochineal insect" and that "Dr. Anderson used to supply His Majesty's ships of war in the Madras roads with the green leaves which were used as an antiscorbutic after being boiled as an ordinary vegetable". As noted above the statement that Dr. Anderson introduced *Opuntia cochinelifera* is quite correct. In his list of famine foods, p. 237, he names an "Opuntia vulgaris," adding the Tamil name for Opuntias "Chuppauthumoolloo," whereby he assuredly meant *Opuntia Dillenii.*

Opuntia Dillenii is the only species named by C. B. Clarke in Hooker's *Flora of British India,* ii., 1879, p. 657, where, following Wight Roxburgh's *Cactus indicus* is put under it. It was a not unnatural thing to name no other Opuntia than this as Indian; for at the time good evidence did not exist in books for the determination of any other. Gamble in his *Manual of Indian Timbers,* (1881), p. 208, followed C. B. Clarke in naming his one Indian Opuntia as *Opuntia Dillenii.* Lisboa in his *Useful Plants of the Bombay Presidency,* (1884), pp. 160 and 199, used the same name, without doubt in reference to *Opuntia elatior.*

The identifications began to be set right in the *Kew Bulletin,* 1888, p. 170, where it is recorded "it appears that there are three species of Opuntia more or less common in the neighbourhood of Madras. These are *Opuntia nigricans,* Haw., *Opuntia Dillenii,* Haw., and *Opuntia monacantha,* Haw." In the *Proceedings of the Agri-Horticultural Society of Madras* for the same year, p. 16, is an extract from a letter from Lieutenant-Colonel H. W. R. Cox, wherein is recorded a statement that two Opuntias were then growing at Bellary, which are identified as *Opuntia nigricans* and *Opuntia Dillenii;* and again on p. 90 is a note saying that he had found *Opuntia monacantha* at Hospet and Penuchonda in the same part of India. It is obvious that by the name *Opuntia nigricans* the species *Opuntia elatior* is meant.

Marshall Woodrow in 1888 (*Proceedings of the Agri-Horticultural Society of Madras*, p. 5) remarked that apparently only one Opuntia, which he called *Opuntia nigricans* (i.e., *Opuntia elatior*) was commonly naturalised in Western India ; but it seemed possible that a second, only somewhat distinct Opuntia, might occur near Poona. In the Proceedings of the same Society for 1901, p. 9, *Nopalea cochinelifera* is mentioned as growing well at Poona, but declining to grow at Madras. Either the true *Opuntia cochinelifera* or *Opuntia decumana* is intended there. In the *Dictionary of Economic Products*, v, 1891, p. 490, Sir George Watt used the name *Opuntia Dillenii* in the same wide sense as C. B. Clarke.

In 1894 Talbot (*Systematic List of Trees, Shrubs of the Bombay Presidency*, p. 101) remarked that several species had been introduced into India, and were wrongly put under *Opuntia Dillenii* in the Floras. Gamble in the second edition of his *Manual of Indian Timbers*, (1902), p. 382, named *Opuntia Dillenii* and *Opuntia* (?) *spinosissima*, Mill., as Indian. The first he thought to have been the Opuntia grown before 1795 at Masulipatam: by the second name he meant *Opuntia elatior*. The Opuntia grown at Masulipatam evidently was *Opuntia cochinelifera*, the Kew Nopal.

In 1895 in the *Records of the Botanical Survey*, i, p. 89, Marshall Woodrow recorded *Opuntia nigricans* as occurring about Poona: this plant evidently was *Opuntia elatior*. In the *Records*, i, 1898, p. 200, Gammie recorded *Opuntia Dillenii* as in the Kángra Valley: this probably was *Opuntia monacantha*. In the *Records*, ii, (1902), p. 107, Wood recorded *Opuntia Dillenii* as occurring in Chota Nagpur: a specimen from him preserved at the Royal Botanic Gardens, Calcutta, is of *O. monacantha*: and in the *Records*, ii, 1902, p. 181, Gammie recorded *Opuntia nigricans* for Satára and Jámbusar, doubtless meaning *Opuntia elatior*.

Sir Henry Collett in his *Flora Simlensis*, 1902, p. 446, named *Opuntia Dillenii* as occurring in hedges near Simla. Doubtless by this name he meant *Opuntia monacantha*.

Dr. Theodore Cooke in his *Flora of the Bombay Presidency*, i, 1903, p. 852, records as occurring *Opuntia Dillenii* and *Opuntia nigricans*: the latter is *Opuntia elatior*.

Colonel Prain (*Bengal Plants*, 1903, p. 531) names *Opuntia Dillenii* only as occurring in Bengal.

Gammie (*Journ. Bombay Nat. Hist. Soc.*, xv, 1903, p. 286) says that *Opuntia nigricans* grows about Kárla. *Opuntia elatior* is doubtless meant.

In 1905 Major A. T. Gage recorded *Opuntia monacantha* as growing at Sidoktaya in the district of Minbu, Burma (*Records of the Botanical Survey of India,* iii, p. 63). This name is correct.

Prain in the same volume of the *Records,* (1905), p. 218, names *Opuntia Dillenii* as found near Calcutta : this name is also correctly used. Heinig (*List of Plants of the Chittagong Collectorate,* 1907, p. 27) perhaps refers to *Opuntia monacantha* in recording *Opuntia Dillenii* as found in that district.

Sir Dietrich Brandis (*Indian Trees,* 1906, p. 316) used the name *Opuntia Dillenii* to denote all the Indian species, as in Sir Joseph Hooker's Flora.

Sir George Watt (*Commercial Products of India,* 1908, p. 348) names the following Opuntias as Indian :—*Opuntia decumana, Opuntia Dillenii, Opuntia Ficus-indica,* and *Opuntia monacantha* and *Opuntia Tuna.* His *Opuntia Tuna* is Röttler's *Cactus Tuna,* which I believe to be *Opuntia Dillenii ;* his *Opuntia monacantha* is correctly named ; his *Opuntia decumana* is *Opuntia cochinelifera ;* his *Opuntia Ficus-indica* is *Opuntia elatior ;* his *Opuntia Dillenii* is correctly named.

Witt (*Forest Flora of the Berar Circle,* 1908, p. 45) records *Opuntia Dillenii* as common in Berár as about Khandwá. *Opuntia elatior* is the species meant.

Brühl (*Journ. Asiatic Soc. Bengal,* 1908, p. 619) used the name *Opuntia Dillenii* in the sense of the Flora of British India.

Father Blatter's *Opuntia Dillenii* "run wild" in north Coimbatore (*Journ. Bombay Nat. Hist. Soc.,* xviii, 1908, p. 408) is likely to be rightly named ; but his *Opuntia Dillenii* "not common" in Cutch (*Journ. Bombay. Nat. Hist. Soc..* xviii, p. 772) is likely to be *Opuntia elatior.*

Bamber (*Journ. Bombay Nat. Hist. Soc.,* xix, 1910, p. 948) obviously refers to both *Opuntia elatior* and *Opuntia monacantha* as Punjab plants under the one name of *Opuntia Dillenii.*

SUMMARY OF SYNONYMS IN INDIAN BOOKS.

In brief the names in the literature reviewed may thus be put together :—

Opuntia cochinelifera, Miller, Gard. Dict., ed. 8, (1768), no. 6. With synonyms and pseudonyms as follows :—

Opuntia cochinillifera, Voigt, Hortus Suburb. Calcuttensis, 1845, p. 63 : Kurz, Prelim. Report Forests Pegu, 1875, Appendix C., p. x (presumedly).

Opuntia delenii, Shortt, in Indian Forester, iii, 1878, p. 233.

Opuntia decumana, Watt, Commercial Products of India, 1908, p. 348.

Cactus coccinellifer, Roxburgh, Hortus Bengalensis, 1814, p. 37.

Nopalea cochinillifer, Bourne, in Proc. Agri-Hort. Soc. Madras, 1901, p. 9.

Opuntia monacantha, Haw., Supplem. Plant. Succulent., 1819, p. 81 : Kew Bulletin, 1888, p. 170 : Cox in Proc. Agri-Hort. Soc. Madras, 1888, p. 90 : Gage in Records Bot. Survey, iii, (1905), p. 63 : Watt, Commercial Products of India, 1908, p. 348. With synonyms and pseudonyms as follows :—

Opuntia cochinillifer, Munro, Hortus Agrensis, 1844, p. 19.

Opuntia Dillenii, Wight and Arnott, Prodromus Floræ Peninsulæ Indiæ Orientalis, 1834, p. 363 (in lesser part) : Voigt, in Trans. Agri-Hort. Soc. India, vi, 1839, Appendix, p. 32, and Hortus Suburbanus Calcuttensis, 1845, p. 63 : Kurz, Prelim. Rep. Forests Pegu, 1875, Appendix C., p. x (presumedly) : C. B. Clarke in Hooker's Flora Brit. India, ii, 1879, p. 657 (in part) : Gamble, Manual Indian Timbers, 1881, p. 208 (? in part) : Watt, Dict. Economic Products, v, 1891, p. 490 (in part) : Gammie in Records Bot. Survey, i, (1898), p. 200 (probably) : Wood in Records Bot. Survey, ii, (1902), p. 107 : Collett, Flora Simlensis, (1902), p. 446 : Brandis, Indian Trees, 1906, p. 346 (in part) : Heinig, List Chittagong, 1907, p. 27 : Brühl in Journ. Asiatic Soc. Bengal, 1908, p. 619 (in part) : Bamber in Journ. Bomb. Nat. Hist. Soc., xix, 1910, p. 948 (in part.)

Opuntia vulgaris, Baden Powell, Punjab Products, 1872, p. 194.

Cactus cochineliferus, Buchanan-Hamilton, ined.

Cactus cochinellifer, Buchanan-Hamilton, ined.

Cactus indicus, Roxburgh, Hortus Bengalensis, 1814, p. 37 (nomen nudum) : Roxburgh, Flora Indica, iii, 1832, p. 475 : Taylor, Sketch Topography Dacca, 1840, p. 57 (presumedly) : Madden in Journ. Asiatic Soc. Bengal, xvii, 1845, p. 583 : Stewart, Punjab Plants, 1869, p. 101.

Cactus Ficus-indica, Loureiro, Flora Cochinchinensis, 1790, p. 306 (presumedly) : Ainslie, Materia Medica of Hindustan, 1813, p. 91 : Wilks, Historical Sketches of the South of India, iii, 1817, p. 89.

Cactus sylvester, Röttler, ined.

Cactus sp., Buchanan-Hamilton, Journey through Mysore, 1807, p. 400.

Opuntia sp., Griffith, Posthumous Papers, Journals, 1847, p. 313 (probably).

Opuntia elatior, Mill. Gard. Dict., ed. 8, (1768), no. 4 : Voigt, Hortus Suburbanus Calcuttensis, 1845, p. 63 (probably). With synonyms and pseudonyms as follows :—

Opuntia Dillenii, Graham, Catalogue of the Plants growing in Bombay, 1839, p. 83 (presumedly) : Dalzell and Gibson Bombay Flora, Supplement, 1861, p. 39 (presumedly) : C. B. Clarke in Hooker's Flora of British India, ii, 1879, p. 657 (in part) : Gamble, Manual Indian Timbers, 1881, p. 208 (? in part), Lisboa, Useful Plants of the Bombay Presidency, 1884, pp. 160 and 199 (presumedly) : Watt, Dict. Econ. Products, v, 1891, p. 490 (in part) : Brandis, Indian Trees, 1906, p. 346 (in part) : Witt, Forest Flora of the Berar Circle, 1908, p. 45 : Brühl, in Journ. Asiatic Soc. Bengal, 1908, p. 619 (in part) : Blatter, in Journ. Bombay Nat. Hist. Soc., xviii, 1908, p. 772 (presumedly): Bamber, in Journ. Bombay Nat. Hist. Soc., xix, 1910, p. 948.

Opuntia nigricans, Kew Bulletin, 1888, p. 170 : Marshall Woodrow in Proc. Agri-Hort. Soc. Madras, 1888, p. 5 : Cox in Proc. Agri-Hort. Soc. Madras, 1888, p. 16 : Marshall Woodrow in Records Bot. Surv. Ind., i, 1895, p. 89 : Gammie in Records Bot. Surv. Ind., ii, 1902, p. 181, and in Journ. Bombay Nat. Hist. Soc., xx, 1903, p. 286 : T. Cooke, Flora Bombay Presidency, i, 1903, p. 852.

Opuntia ? spinosissima, Gamble, Manual Indian Timbers, 2nd edit. 1902, p. 382.

Opuntia Ficus-indica, Watt, Commercial Products India, 1908, p. 348.

Cactus Ficus-indica, Herb. Röttler, ined.

Cactus Tuna elatior, Roxburgh, Hortus Bengalensis, 1814, p. 37 (probably).

Opuntia Dillenii, Haworth, Supplement. Plant. Succulent., 1819, p. 79: Wight and Arnott, Prodromus Floræ Peninsulæ Indiæ orientalis, 1834, p. 363 (excluding synonyms): Munro, Hortus Agrensis, 1844, p. 19: Wight, Illustrations Ind. Bot., ii, 1850, p. 48, plate 114: C. B. Clarke in Hooker's Flora Brit. Ind., ii, 1879, p. 657 (in chief part): Gamble, Manual Indian Timbers, 1881, p. 208 (? in part only): Kew Bulletin, 1888, p. 170: Cox in Proc. Agri-Hort. Soc. Madras, 1888, p. 13: Watt, Dict. Econ. Products, v, 1891, p. 490 (in part): Gamble, Manual Indian Timbers, 2nd edit., 1902, p. 382 (? in part): To Cooke, Flora Bombay Presidency, i, 1903, p. 852: Prain, Bengal Plants, 1903, p. 531, and in Records Bot. Survey, iii, 1905, p. 218: Brandis, Indian Trees, 1906, p. 346 (in part): Watt, Commercial Products India, 1908, p. 348: Brühl in Journ. Asiatic Soc. Bengal, 1908, p. 619 (in part): Blatter in Journ. Bombay Nat. Hist. Soc., xviii, 1908, p. 408. With two pseudonyms.

Opuntia vulgaris, Shortt in Indian Forester, iii, 1878, p. 237 (presumedly).

Cactus Tuna, Herb. Röttler; Ainslie, Materia Medica of Hindustan, 1813, p. 91: Wilks, Historical Sketches of the South of India, iii, 1817, p. 89: Watt, Commercial Products India, 1908, p. 348.

It must be a matter for warning to all that the name *Opuntia Dillenii* has been used for every one of these four different cacti, the name *Opuntia Ficus-indica* or *Cactus Ficus-indica* for three of them, and *Opuntia cochinelifera*, with some variation in the spelling, for two of them.

OPUNTIA DECUMANA IS CULTIVATED IN INDIA.

In the *Proceedings of the Agri-Horticultural Society of Madras* for 1888, p. 5, Marshall Woodrow refers to the occurrence of the "large thornless Opuntia grown for fruit in Malta and other Mediterranean countries" in plenty at Poona, but refusing to flower. This Opuntia must be *Opuntia decumana*. In 1885 independent attempts were made to establish this same species in Madras, and in the United Provinces. In the *Reports on the Operations of the Department of Agriculture, Madras Presidency*, 1885-86, p. 3, and 1886-87, p. 3, it is recorded that it failed in the hotter parts of Madras, but was grown successfully in the Nilgiris and the Shevaroi hills. It was grown successfully in Lucknow. But whether the plant is growing still at Lucknow and whether it fruits or does not, has not been recorded. It is growing at the present date, and moreover fruiting, in the compound of the Coimbatore jail. But the plant has hitherto shown no tendency to run wild in India. Roxburgh's *Cactus chinensis,* which I believe was this, only flowered once in Calcutta in twenty years (*teste* Voigt, *Hort. Calc. Suburbanus,* 1845, p. 62).

KEY TO THE SPECIES NOW WILD IN INDIA.

Calyx not extended into a tube; stem jointed; joints flat	OPUNTIA.
Stamens exserted (Subgenus Nopalea) .	*O. cochinelifera.*
Stamens not exserted (Subgenus Eu-Opuntia):	
Spines falling except one long one on each cushion	*O. monacantha.*
Several large spines remaining on each cushion:	
Spines all straight, slender, tawny or purplish-black:	
Flowers orange	*O. nigricans.*
Flowers at opening lemon-yellow changing to rose-pink . . .	*O. elatior.*
Spines some curved, the largest stout, light horn-coloured in life, darkening in herbaria with age . . .	*O. Dillenii.*
Calyx tube extended; stem cylindric, ridged	CEREUS *C. pterogonus.*

ILLUSTRATIONS AND DESCRIPTIONS IN STANDARD WORKS.

Species 1.—**Opuntia cochinelifera** is satisfactorily figured in the *Botanic Magazine,* 1827, plate 2472, and in Karl Schumann's account of the Cactaceæ in Martius' *Flora Brasiliensis,* iv., pt. 2, 1890, plate 60, and passably in Pfeiffer and Otto's *Abbildung Blühender Cacteen,* 1843, plate 24, and in Andrew's *Botanists' Repository,* 1808, plate 533. Further there is the old plate in Dillen's *Hortus Elthamensis.*

Species 2.—There is a good figure of **Opuntia monacantha** in the *Botanic Register,* 1835, plate 1726, another good figure, but under the wrong name of *Cactus Opuntia Tuna* in DeCandolle's *Plantes Grasses,* 1820, a good but uncoloured figure in Karl Schumann's account of the Cactaceæ in Martius' *Flora Brasiliensis,* iv., pt. 2, 1890, plate 62, and another showing the habit excellently in Maiden's *Preliminary Study* *of the Prickly Pears naturalised in New South Wales*, Department of Agriculture, N. S. W. Misc. Publ. no. 153.

Species 3.—The name *Cactus nigricans* was given by Haworth in his *Miscellanea Naturalia*, 1803, p. 187, to an Opuntia which he had seen growing, but which had not then flowered; in 1811 it flowered and he sent flowers to Sims who had them drawn for the *Botanic Magazine.* In 1812 Haworth (*Synopsis Plantarum Succulentarum*, p. 189) changed the name of his plant to **Opuntia nigricans** and sent fruits to Sims. Sims published in 1813 the figure 1557 in the *Botanic Magazine.* In 1812 Haworth wrongly put DeCandolle's figure of *Opuntia monacantha* in the *Plantes Grasses* under *Opuntia nigricans*: but that error does not affect the nomenclature.

Species 4.—The history of **Opuntia elatior** is far longer than that of *Opuntia nigricans.* The name dates from Miller's *Gardeners' Dictionary*, 8th edition, (1768), no. 4, where the species is defined as "Opuntia (elatior) articulis ovato-oblongis, spinis longissimis nigrescentibus. Indian Fig with oblong oval joints and very long black spines. Tuna elatior spinis validis nigricantibus, *Hort. Elth.* tab. 194. Taller Indian Fig with strong black spines . . . . The fourth sort grows taller than either of the former (*i.e.*, *Opuntia vulgaris, Opuntia Ficus-indica* of Miller and *Opuntia Tuna*); the branches are larger, thicker and of a deeper green and are armed with strong black spines which come out in clusters like those of the other sorts, but the clusters are further asunder. The flowers are produced from the upper edges of the branches: they are smaller than those of other sorts, and are of a purplish colour as also are the stamina, the fruit is of the same form as those of the first, but do not ripen here."

It will have been noticed that Miller refers to a plant which Dillen had seen growing between 1724 and 1732. Dillen said that his plant was larger than Tuna vulgaris (*i.e., Opuntia vulgaris*) and taller, growing higher than a tall man's height in seven years, with long rigid spines which pass from fusc to black in all cases, and stand out in the star of the five on dice (quincunciali ordine) with at their bases a pencil (brush) of hairs, the flowers small for the size of the plant, passing from yellow (flavus) to purple, the stamens purple, the fruits with clusters of thorns, but not ripening in England.

Miller obviously meant by *Opuntia elatior* to name Dillen's plant, and indeed seems to have taken more of his information from Dillen than from actual observation. Dillen had seen the plant grow up from a seedling under his own eyes in Sherrard's garden. Aiton in 1789 (*Hortus Kewensis*, ii, p. 154) considered that he had this plant in the Royal collection at Kew: and this is by no means impossible. Knowlton, Sherrard's gardener, was only recently dead at that date and had been Aiton's friend.

The first complications in the use of the specific name "elatior" came from Willdenow, who in his *Species Plantarum*, ii, (1799), p. 944, identified with Miller's plant, cultivated in Europe, specimens observed wild. He refers to Euphrasius' travels, to Houttuyn and to one of Jacquin's works—rare works which I have not seen; and he inserted into the brief diagnosis the epithet subulate for the spines. He calls it *Cactus Tuna*, var. *b*.

Aiton still had the plant in 1811 when the second edition of his *Hortus Kewensis* appeared (iii, p. 179), and Haworth who, in only the next year, was the author of the combination—*Opuntia elatior* (*Synopsis Plantarum Succulentarum*, p. 187), and who was a friend of Aiton's, must have known the plant at Kew: indeed he cites Aiton's *Hortus Kewensis*.

Sims in the *Botanic Magazine* (1813), plate 1557, when figuring Haworth's *Opuntia nigricans* makes it and *Opuntia elatior* both varieties of *Opuntia Tuna*. The first is defined, after Haworth, as "erecta, articulis late ovato-oblongis, spinis subulatis longissimis nigrescentibus," the second, as "erecta, articulis oblongis lanceolatisque, spinis diversiformibus fulvo-nigris, majoribus divaricatis 3—10-linearibus."

Pfeiffer in his *Enumeratio diagnostica Cactearum*, (1837), p. 165, put *Opuntia elatior* just after *Opuntia nigricans*, and says of it "Opuntiæ nigricanti valde (forsan nimis) affinis." He quotes Dillen, Miller, Haworth and Wildenow to show what he meant, and gives a description which he must have drawn up himself, for it adds to what had been written before "Stigma 5-fidum. Fructus ruber, ovatus, 1½ poll. longus, 1 poll. diam."

In 1846 Forester in his *Handbuch der Cacteenkunde*, p. 496, enumerated *Opuntia elatior* and said how nearly related it is to *Opuntia nigricans*. Most of what he said, was taken from Pfeiffer, but he apparently knew the plant: he said it was the *Opuntia nigricans* of the Paris garden.

Labouret in the *Monographie de la Famille des Cactacées*, 1853, p. 456, does not add much to what Pfeiffer had said, except to say how to cultivate it. Doubtless he had seen it alive in Paris.

Species 5.—**Opuntia Dillenii** is well figured by Wight in his *Illustrations of Indian Botany*, ii, (1850), plate 114 ; and fairly well figured in the *Botanic Register*, (1817), plate 255.

Species 6.—**Cereus pterogonus** is well figured in the *Botanic Magazine*, (1863), plate 5360.

CONCLUSIONS.

Five species of Opuntia and one of Cereus are shown to have run wild in India. Of them, one—*Opuntia monacantha,* Haw.—apparently came into India much earlier than 1786, when our records begin, possibly as early as 1700 : another—*Opuntia Dillenii,* Haw.—apparently reached Southern India not later than 1750. *Opuntia cochinelifera* came into India in 1786. A fourth species came into India at the very end of the eighteenth or in the first few years of the nineteenth century : it was *Opuntia elatior. Opuntia nigricans* came into India early in the nineteenth century.

Being American plants they have chiefly reached India *viá* Europe. *Opuntia monacantha* was possibly in European gardens in the sixteenth century : it was certainly in English gardens before the end of the seventeenth century. It was established in the Cape in, and probably long before, 1772, as well as in India and possibly also in Cochin-China. *Opuntia cochinelifera* was in England from 1688. *Opuntia Dillenii* was in English gardens from before 1732 and so was *Opuntia elatior.*

Opuntia monacantha in 1795 had spread (probably from the banks of the Hughli) through Bengal up to Dinájpur and perhaps beyond. From the Madras coast, before 1800, it had spread right up to the centre of Mysore and probably further.

In Northern India it has spread, before 1838, to Ludhiána in the Punjab ; and in 1840 Griffith noticed an Opuntia in cultivation in a garden in Káfiristán which doubtless was it.

Before 1875, possibly long before, two *Opuntias,* one probably it had become established in Burma, and of them, the one we are now dealing with, is prevalent at the present date in the dry central zone.

The wild cochineal insect introduced into India in 1795 spread so rapidly on *Opuntia monacantha* as to destroy it, branch and root, out of the countryside. The insect was introduced into both Bengal and Madras ; but owing to the action of the Government of Madras in encouraging its propagation it spread more rapidly there than in Bengal. It had almost done its work of destruction in Southern India in twenty years ; but in the north it took sixty years to travel from

Calcutta up the Ganges valley and over the Punjab plain to Ludhiána—rather more than 800 miles away. Its progress through Bengal is unrecorded ; but the Opuntia had become a pest in the Punjab, and its destruction made such a difference to the face of the country that writers promptly noticed and recorded what was happening.

Opuntia monacantha, thanks to the cochineal insect, which is still with us, is now a comparatively scarce plant. Its survival in Assam in greater quantity than elsewhere is due to the isolation, by reason of the submersion of the country in the rains, of sites suitable for it. The Cactus being used by man for fences, has been carried over the barriers, but not the cochineal.

The abundance of the Cactus in India before its enemy, the cochineal insect, was introduced seems to be proof that the Portuguese did not introduce the latter into India : I do not know any reason for stating, as has been done, that they probably did so.

Opuntia Dillenii, unchecked by the cochineal insect, has continued to spread in Southern India and is now the commonest species there. It occurs about Calcutta ; and before 1840 it had been taken to Agra, where it grows still.

Opuntia elatior ran wild after 1800 from Calcutta and spread through the north of India. Its great prevalence about Patna and Delhi suggests that it was early taken to those two places. From Delhi it was taken to the Deccan, where its spread has been most rapid. It is now invading the Central Provinces from the west, and has reached Nágpur. It is in Western India sometimes attacked by the coccid *Diaspis cacti ;* but the attack is mild.

Opuntia cochinelifera has never got a firm hold in the country, but has been taken since 1800 to various places including Burma.

The failure of the spineless *Opuntia cochinelifera* and the one-spined *Opuntia monacantha* to take firm hold of the country, though largely due to the avidity with which the wild cochineal attacks them, is also due to the inferior fence that they make. The rapid dispersal of *Opuntia elatior* and *Opuntia Dillenii* through the country has been undoubtedly due to their use in making fences. A practice of the middle part of the last century of using them round cantonments, and the fine fence,—the ' Salt-wall,'—made over miles of country along the Rajputana border to prevent smuggling, undoubtedly afforded the plants many new starting points for fresh encroachments : even now *O. elatior* forms a splendid jail fence at Dhárwár. Thus have they spread, birds aiding in their dispersal through short distances by carrying the seeds when they eat the fruits.

The rarity of Opuntias in rice-growing tracts is noteworthy. Rice fields are not fenced, and Opuntias have not had encouragement. It is among garden lands and about villages that they mostly flourish, and the practice of using them for the protection of young shade-trees along roadsides has often greatly increased their spread.

All the species established in India flower freely : those which Roxburgh and others introduced into India, which did not flower freely, have died out.

On pp. 292—295 above and in the accompanying map the present dispersal of Opuntias in India is given ; it is there shown that *Opuntia elatior* is pre-eminently the Opuntia of the west, and *Opuntia Dillenii* the Opuntia of the south. *Opuntia monacantha* is the one chiefly found to the north-east.

Opuntias are rare in the Punjab plain away from the canals except about Delhi : but *Opuntia monacantha* has recently been used much for clothing hillocks in Lahore. They have not penetrated the hills of the Central Provinces nor the hills of Burma.

On pp. 311—314 above, the nomenclature of the books is corrected.

For the purpose of this paper Linnæus' herbarium, and Wallich's herbarium preserved by the Linnean Society of London, the herbarium of the British Museum of Natural History, South Kensington, and the herbaria of the Royal Botanic Gardens, Kew and Calcutta, have been examined. Linnæus' and Wallich's herbaria did not help in the investigation.

Enquiries made from Mr. Couchman, Director of Agriculture, Madras, led to the detection of *Opuntia decumana* at Coimbatore. To him, to Mr. W. Kirkpatrick who called my attention to the "Salt wall" of Opuntia on the Rajputana border and to Mr. Mahaluxmiwala, Superintendent of the Municipal Gardens, Bombay, who supplied specimens on request for study, the author's best thanks are cordially given.

The author hopes that his work will prevent any waste of money in fruitless attempts to destroy prickly pear by means of the cochineal insect. Such attempts, as have been made in the past, have been made in ignorance of the true food plants of that little insect.

CHRONOLOGY.

Before 1786, probably long before, *Opuntia monacantha* was established in Bengal and Madras, its introduction having been due apparently to its use on board ship as a food.

Before 1786, *Opuntia Dillenii* was established in Madras.

1788. *Opuntia cochinelifera* introduced from the King's Garden at Kew, to Dr. Anderson's Garden at Masulipatam, and soon after introduced into the newly founded East India Company's Botanic Garden at Calcutta.

1788. The East India Company gave sealed orders to their ships proceeding to Brazil to procure, if possible, the cochineal insect.

1790. Battle of Poongar, when Tippoo's horse got entangled among *Opuntia* hedges,—a circumstance showing the abundance of the plant in Mysore.

1795. A Captain Neilson brought a supply of cochineal insect, afterwards classed as "sylvester," from Rio de Janeiro to Calcutta, where Roxburgh found that it would grow on *Opuntia monacantha,* and whence early he sent a supply to Dr. Anderson in Madras.

1796. A plantation of *Opuntia* probably *O. monacantha,* made as a speculation at Rishra near Calcutta; but there is no record of cochineal having been grown on it.

1796. Orders by the East India Company in Madras to their Collectors to protect the Opuntias in all parts of their charges; a small supply of cochineal insect distributed to each of them, which they were to get cultivated, and they were to obtain from the villagers the prepared cochineal at a fixed rate.

1799. Big export of cochineal to England. Roxburgh received in Calcutta an *Opuntia* which he called "Cactus Opuntia" probably being *Opuntia nana,* which persisted for a time in cultivation almost without flowering, but did not establish itself as a wild plant.

1800. Anderson received an *Opuntia* from abroad which he sent on to Roxburgh in 1801, and which proves to have been *Opuntia elatior,* now a plant wild widely over India.

1800 ? Roxburgh received from China *Opuntia decumana,* which grew but indifferently in Calcutta and did not establish itself as a wild plant. He also received what may have been the true *Opuntia Tuna*: it has not run wild.

1801. Buchanan-Hamilton observed in Central Mysore how with avidity the introduced cochineal was destroying *Opuntia* (evidently *Opuntia monacantha*).

1806 ? *Opuntia nigricans,* brought into the East India Company's Botanic Garden at Calcutta from England.

1807. The East India Company realising that they could not make a profit out of their dealings in cochineal began to withdraw their encouragement, and stopped it after 1810.

1807. Renewed proposals to obtain cochineal "grana fina" from South America; *Opuntia cochinelifera* suggested to be used as a nurse plant for it.

1821. G. A. Prinsep introduced the cochineal insect into Bombay from Campeche *viâ* London, possibly on *Opuntia cochinelifera.* Fate of experiment unrecorded.

1822. G. A. Prinsep repeated his introduction. Fate of experiment unrecorded.

1826? Perrottet brought the cochineal insect from Bourbon to Pondicherry and preserved it for three generations. To Bourbon it had been brought in 1826 from Cadiz; and Cadiz had received it from America in 1820.

1830 or earlier. Seed of *Opuntia elatior* taken from Delhi to the Deccan by a traveller in a palanquin.

1837. Wallich hearing that cochineal was in Bourbon, obtained some for Calcutta: it was pronounced grana sylvester, though derived from a stock said to be grana fina, and apparently not cultivated.

1837. Cochineal received in Calcutta from the Cape of Good Hope on rooted plants of *Opuntia monacantha,* which was also pronounced grana sylvester.

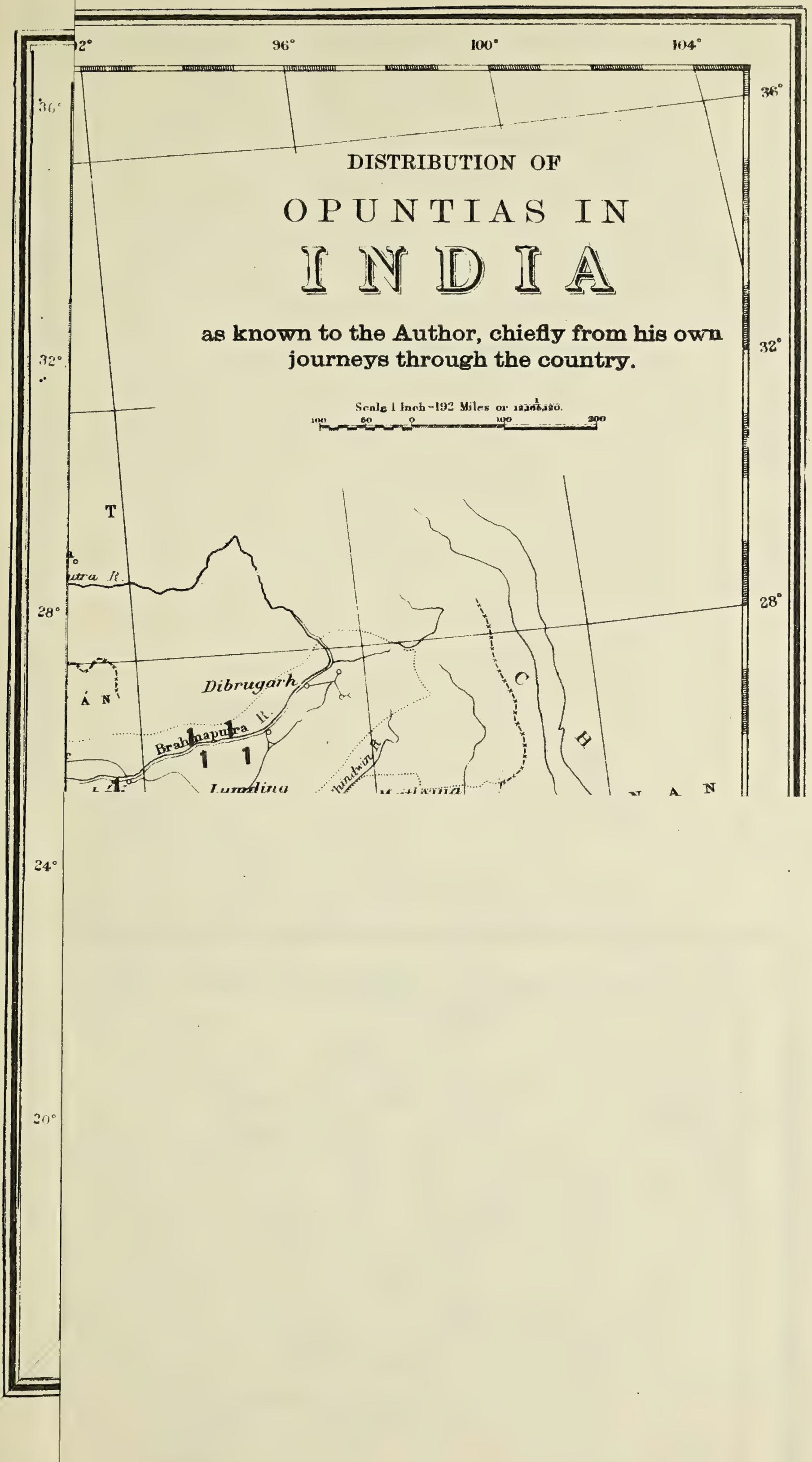
1839. Opuntias so troublesome in the Deccan that an attempt was made in vain to extirpate them. About the same time *Opuntia monacantha* had become so troublesome in parts of the Punjab that fines were instituted against those who let it grow.

1840. The Bourbon Nopal—apparently *Opuntia cochinelifera*—was vigorously propagated by the Agri-Horticultural Society in Calcutta in the hope of using it for a nurse plant for the grana fina insect which the Society was seeking to get.

1844-52. The outbreak of the cochineal insect in the Punjab, most marked and most effective, as regards *Opuntia monacantha.*

1861. One Opuntia, apparently *O. elatior,* had just reached the neighbourhood of Deesa.

1883. The Government of Madras re-introduced at Coimbatore the cochineal insect from Algiers, but the insects died after arrival.



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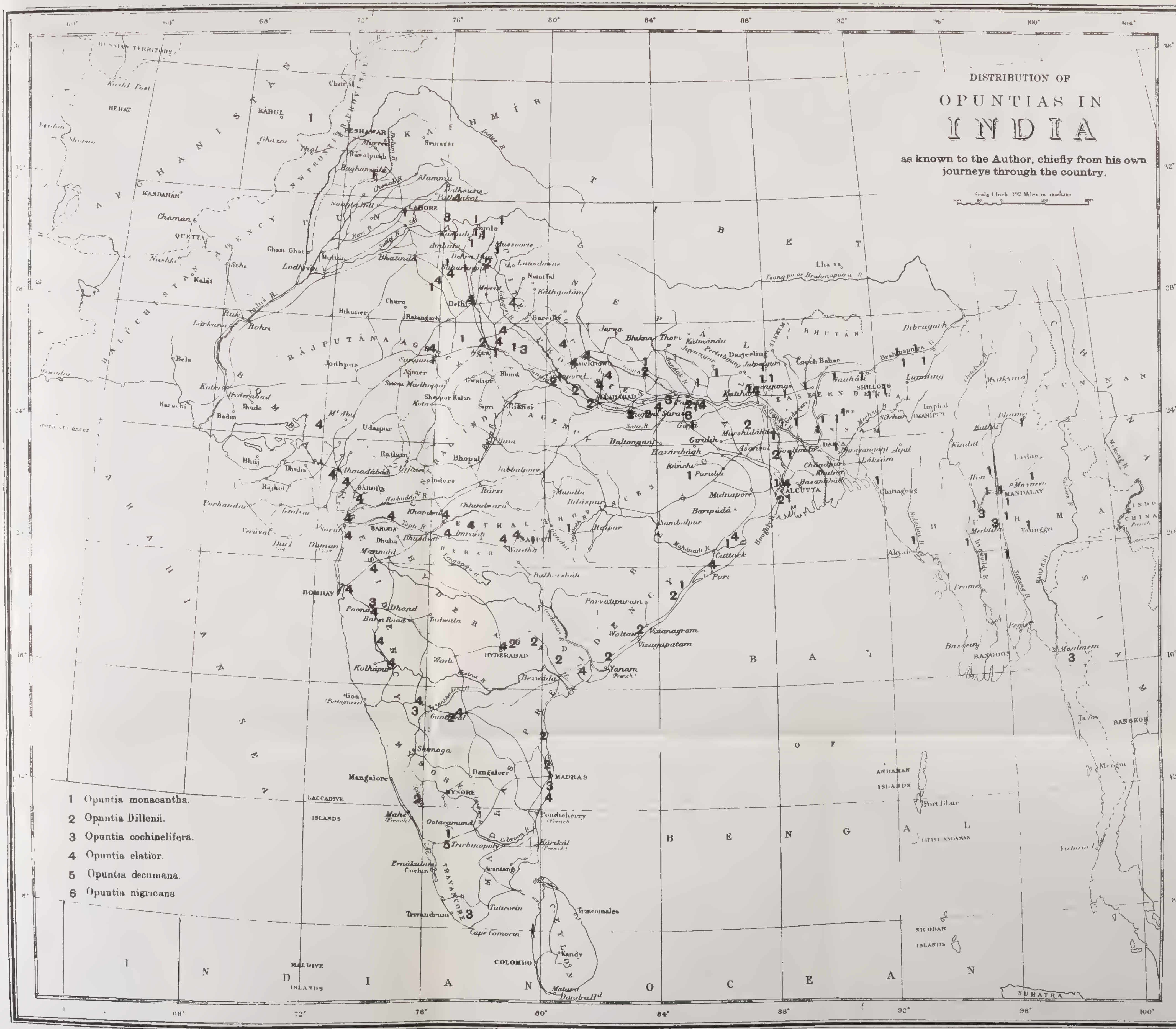

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1 Opuntia monacantha.

2 Opuntia Dillenii.

3 Opuntia cochinelifera.

4 Opuntia elatior.

5 Opuntia decumana.

6 Opuntia nigricans

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THE ALPINE AND SUB-ALPINE VEGETATION OF SOUTH-EAST SIKKIM

BY

W. W. SMITH

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THE ALPINE AND SUB-ALPINE VEGETATION OF SOUTH-EAST SIKKIM.

By

W. W. Smith.

INTRODUCTION.

The writer was deputed in July—August 1910 by Major A. T. Gage, I.M.S., Director of the Botanical Survey of India, to explore botanically South-East Sikkim, more especially the ridges lying between the Cho-La and the Tanka-La. Both these passes were visited by botanist many years ago, by the late Sir Joseph Hooker and the late Mr. C. B. Clarke, and more recently (1892) by Mr. G. A. Gammie. However the intervening country, a tangle of hills with deep wooded valleys, was unknown and offered an inviting field for investigation. The area is one of the wettest in the Himalayas, exposed to almost the full force of the monsoon rains. During July and August it rained every day, often all day and generally the greater part of every day. The actual total of inches is probably less than what is received on the outer hills below and at Darjeeling, as owing to the elevation the rain is frequently more of a drizzle than a downpour, but the amount of sunshine during the short flowering season is very limited. The conditions approximate to those of the Singalela Range with less violent winds.

I left Darjeeling on June 29th with Lepcha collectors and coolies travelling *viâ* Namchi, Temi, Song and Gangtok. As the Chola Range is practically without settled inhábitants, there being only a few herdsmen during the summer months, arrangements were made at Gangtok, the capital of Sikkim, for food supplies. Gangtok was left on July 3rd by the Changu road which leads to the Nathui La, one of the chief passes into the Chumbi Valley. The greater part of this road was surveyed and completed for the Tibet expedition of 1903-04 as a means of relief to the Dzalep-La (Jélep La) route and is an excellent one throughout, presenting little difficulty beyond the climb of 10,000 feet in a journey of about 30 miles. The first march is to the Karponang bungalow, a gradual rise from 5,000 to 9,000 feet. The forest vegetation corresponds closely to that of the Darjeeling District at the same elevation. Signs of cultivation soon disappear and at Karponang there are only a few huts near the bungalow. It is not an area to attract the cultivator, the valley being very wild and the slopes steep. The road has been cut with considerable difficulty, here and there overhanging deep precipices. *Didymocarpi* frequent these rocky cuttings. *Didymocarpus,* as has been pointed out by Ridley in connection with the Malayan Flora, is very restricted in its specific distribution. The Sikkim species are no exception to the rule and the Burmese species seem similarly restricted. The same is true of the closely allied genus *Chirita.* Near Karponang I picked a branch from a shrub which at the time I took to be *Leycesteria glaucophylla,* but subsequent comparison in the herbarium showed it to be a new species allied to the Chinese *Leycesteria sinensis.* I have named it *Leycesteria Belliana* in honour of Mr. C. A. Bell, the Political Officer of Sikkim, who has made botanical collections in the Chumbi Valley. I was in hopes that the native collectors would secure the plant later in seed but on returning in October they were unable to find the shrub again. No doubt it had shed its leaves and was difficult to distinguish. Only four other species of this genus are known and the plant would be an interesting addition to the gardens of Europe. The roadside yielded another new species in *Swertia ramosa.*

The next day was spent in the vicinity of Karponang exploring the ridges above the bungalow and also the steep slopes below which lead to the Roro Chu. On the 5th we proceeded to Changu, a further rise of 3,000 feet. For the first five miles to Laghep the road is fairly level running through the narrowing valley, but high above the stream. The vegetation up to 10,000 feet was somewhat backward but above that a fine blaze of colour greeted us. The plants of alpine Sikkim make the most of their short flowering season. Above Laghep the ground rapidly rises to the lake of Changu which is near 12,000 feet elevation. In fine flower were *Cathcartia villosa, Meconopsis, Trollius, Anemone, Primula sikkimensis, Primula reticulata. Primula geraniifolia,* a plant hitherto known only from the Chumbi Valley, is not uncommon by the rocky slopes and more occasional is its near ally, the rare *Primula vaginata.* Also noteworthy were the scarce *Cathcartia lyrata,* the peculiar *Parnassia tenella* near the ruined Laghep bungalow and *Roscoea alpina* the rarer of the two Sikkim species and usually a plant of the drier ranges. The forest is here comparatively open but that may be due in great part to the cutting of firewood for the camp during the transit of gangs of coolies in 1903-04.

Changu and Laghep.

Changu lake is a fairly large one for Sikkim, being quite half a mile long, but like all the Sikkim lakes is almost destitute of plant life.

With the exception of paludal species on the banks it has no phanerogamic flora. A dâk-bungalow is pleasantly situated on the slope at the north end and formed a most convenient centre for my subsequent operations. The route is now little used as the Dzalep La is a more direct road for the Chumbi Valley. The number of storehouses and huts is a reminder of the Tibet expedition when the place had a transient importance. Now it is one of the most desolate posts in Sikkim. The Chumbi boundary at the Nathui La lies about eight miles to the east.

Changu and its lake lie in a hollow girt by irregular ridges which rise to 14—15,000 feet. In the valley basin there is a fair extent of what may be termed coarse meadow, where *Ranunculaceæ* and *Primulaceæ* are much more prominent however than *Gramineæ.* The slopes above are in most places covered with Rhododendrons, but here and there are open spaces cleared by shepherds. These extend in places to the top of the ridges and afford a very varied pasturage of herbs and prostrate shrubs.

On the 6th we climbed the hills lying to the west which do not rise above 14,000 feet. The slopes soon become rocky and barren. The limit of vegetation and the absolute altitude reached by typical individual species seem to be lower here than in other parts of Sikkim. In the Zemu and Llonakh valleys similar plants range at least 1,000 feet higher, but these latter valleys are drier than those of south-east Sikkim and the surrounding sheltering mountains much loftier. Thus in Western and Northern Sikkim an altitude of 15,000 feet gives a conspicuous and varied flora, while a height of 15,000 feet in the Changu area is usually a crest of bare rocks exposed to the force of the rains, so that the altitude reached by prevalent alpines in this area is much lower in many cases than what is recorded in the flora of British India, as a glance at the appended list will show. The snow must lie long on these Chola hills, melting slowly in the prevailing mists, and thus various conditions combine to give the alpine flora an exceedingly short flowering season.

The most tenacious phanerogams on the upper rocks and sometimes the only ones I found were *Primula muscoides* and *Chrysosplenium carnosum.* Minute forms of *Cochlearia, Arenaria, Potentilla, Saxifraga* and *Polygonum* occur sparingly on the wind swept crests. From 12—13,000 feet the vegetation was in early July in full bloom. The tall *Gentiana stylophora* and *Swertia Hookeri* were very conspicuous. *Rheum nobile* was scarce, appearing at 13,500 feet, which is comparatively low for it. *Primula* was especially prevalent with a dozen fine species. The large species of *Senecio* of the section *Ligularia* were just coming into bud and formed a considerable element in the vegetation. As everywhere in temperate and alpine Sikkim there were miles of Rhododendron, the more alpine species being still in flower. Trees occurred in the more sheltered corners. Two miles above Changu, and also just below the lake, were forests of *Abies Webbiana.* Unfortunately many of the trees were dead, as during the Tibetan expedition their lower bark was freely stripped off by the host of coolies employed for the carriage of supplies and used by them for shelter against the monsoon deluges. So now between Laghep and Changu are scores of naked giants tottering in decay. No other trees were here the rivals of the *Abies* in height or girth. *Acer, Prunus, Rosa, Pirus, Viburnum, Betula, Salix* were present in stunted forms.

The herbaceous flora was at its best and I secured many interesting species. A rare *Potentilla* (*P. sikkimensis* Prain) allied to *P. purpurea* was found on the cliffs about 13,000 feet, and by the lake another new *Swertia* (*S. Burkilliana.*); in shady rocks by the stream a new *Arenaria* (*A. Balfouriana*); *Loxostemon pulchellus* appeared here and there but never in quantity. Ripe fruit of this I have never been able to secure, the plant being difficult to find late in the year. The fruit would be of interest as the position of the genus is still somewhat doubtful. I noticed the occasional presence of bulbils in the axils of the leaves; these are ovoid, apiculate, 8—12 together, and are possibly homologous with the clustered mass of bulbils at the root.

After two days given to the flora round Changu, we ascended on the 9th of July to the Nathui La. The pass is a very easy one to surmount and can be reached within two or three hours from Changu. The elevation is 14,250 feet. The vegetation at the top of the ridge was but little different from what I found at 13,000 feet. The more conspicuous plants were *Caltha scaposa, Cochlearia scapiflora, Potentilla Sibbaldi, P. peduncularis, P. microphylla, Saussurea* sps., *Rhododendron campanulatum, R. anthopogon, R. lepidotum, Cassiope fastigiata, Primula obtusifolia, P. Stuartii, P. pusilla, P. sapphirina.*

Two days were given to the area south of Changu including Laghep. Among the more interesting plants was a *Cardamine* which is, I believe, *Cardamine Griffithii.* Griffith's original specimens from Bhutan have no flowers but the vegetative parts agree. It is a more delicate plant than *Cardamine macrophylla* and makes a better 'cress.' So few alpine species are edible that this one is worth noting in a land where vegetables are scarce. *Rheum acuminatum, Rheum nobile* and *Smilacina oleracea* are also worth attention from this point of view. Species of *Arisaema* were plentiful at Laghep but edible only by the greatly daring. *Senecio Kingianus,* a fine new species about three feet high, was also abundant to the south of Changu associated with *S. Mortoni.*

On the 12th we camped at Sherabthang under the Nathui La, and examined the fairly extensive marshes there. One day was given to the ridges which lie between the Dzalep and the Nathui La. The most interesting find was another new *Senecio* (*S. Lagotis*), a handsome plant with large entire leaves resembling those of a *Bupleurum*.

Survey of the Flora in early July.

The following is a brief survey of what seemed to me the chief characteristics of the flora at this season (first half of July). From 12,000 to 13,500 feet the vegetation seemed somewhat backward as compared with the more northerly parts of Sikkim but those species of *Meconopsis, Rhododendron, Primula,* which occur in both areas, appeared to be in about the same stage of development. The more alpine species, 13,000—14,500 feet, were decidedly later than the flora of the Lachen and Lachung valleys. They have to endure more constant rain and obtain much less sun. Pasturage was scanty and flocks few. I saw only one or two herds of cattle and scarcely any yaks. The valleys are open and the slopes of fairly easy ascent except for the Rhododendrons which, when wet, and that is the rule in July, present as uncomfortable a barrier as can be met with in an alpine tract. The bottoms of the valleys are marshy and showed a fine growth of *Caltha, Trollius* and *Primula.* The number of species was not great. Small glacial lakes appeared at intervals as the main passes were approached; the prevailing vegetation fringed their borders but not even *Callitriche* and its allies invaded the chilly waters. *Rhododendron campanulatum* was the chief constituent of the shrubby vegetation, with occasional tracts of *Pirus* and *Salix*. *Berberis macrosepala* was the most prominent of the smaller shrubs. The herbaceous vegetation was very luxuriant, above the general level of which towered the tall *Meconopsis paniculata, Gentiana stylophora, Swertia Hookeri* and *Senecio Kingianus.* The *Primulæ* were a special glory of the slopes and meadows. The most conspicuous was a white *P. Stuartii* with a somewhat oblique corolla, perhaps a distinct species. This was found in great profusion among the Rhododendrons, especially on the rising ground a mile above Changu and close to the road. Smaller and also presenting here a white or very pale yellow corolla was *P. reticulata*. Along with these two and ranging also somewhat lower with a preference for a moister habitat was *Primula sikkimensis* with yellow corolla and sweet scent. *Primula obtusifolia* occurs at the same elevation with a tendency to range higher than the other species. I found it abundant at 14,500 feet, which is high for plants on this range. These four species were in full flower and in the greatest profusion rivalling any display of Cowslips in an English meadow. Of the smaller flowered species *P. sapphirina* was in thousands, every marsh and every slope being studded with it. *P. pusilla* was associated with it but was much less common. In the drier northern Sikkim it is the most prevalent of the smaller species. *P. soldanelloides* was plentiful in crevices in the wet black rocks about 13,500 feet. Much more occasional was *P. glabra,* almost past flower. Patches of *P. petiolaris* were common enough but this, the earliest of Sikkim *Primulæ,* was long out of flower. *Primula denticulata,* the commonest of the Himalayan primroses, I did not see in this area but its near ally, *P. capitata,* was just opening its flowers. Of the rarer species *P. Kingii* was in profusion in the wet meadows at Sherabthang, 13,000 feet, and all the way to Kapoop. *Primula Wattii*—a beautiful plant rarely met with—was found to the north-west of Changu, on the track which leads to Chamnago at an elevation of over 13,000 feet. *P. Elwesiana,* another rare and striking species, was collected two miles above Changu where a large stream crosses the road. Ranging lower towards Laghep, 9—10,000 feet, were *P. geraniifolia* and *P. vaginata,* the former frequent, the latter very sparingly. *P. muscoides* appeared on the bleak rocks at 14,000 feet, and more rarely *P. tenuiloba.* *P. involucrata* was frequent in the wet Sherabthang pastures. The genus *Androsace* I did not meet with till later, as it favours the drier regions to the north. I have given in some detail the habitat of these primroses as they are among the most desired of Sikkim plants for European gardens. There is no fear that their inclement home will fail to protect them from unfair depredations. Saxifrages were uncommon but it was early in the season for them. *Saxifraga micrantha* and *S. pallida* were frequent however. *Compositæ* were plentiful but not in full flower. *Senecio* was the predominant genus in the wet region. In northern Sikkim its place is taken by *Saussurea* which favours Tibetan conditions.

So far I had not seen one leguminous plant in the area between 11,000 and 14,000 feet. Of *Rosaceæ, Potentillæ* were prominent with *Geum elatum, Pirus,* and *Rosa sericea.* *Umbelliferæ, Rubiaceæ* and *Labiatæ* were poorly represented. *Scrophularineæ* were represented by a few species chiefly of *Pedicularis.*

In number of species the vegetation compares favourably with that of West Sikkim though nowhere is it as rich as in such favoured spots as Jongri. The blaze of colour is as fine as anything in the west or north of Sikkim.

The next few days were spent in the neighbourhood of the Natnui La. We made several attempts to penetrate along the boundary north of the pass but found it too arduous a course to the Chola for laden men. Almost continuous mist and rain rendered it difficult to take any bearings. This boundary ridge is bleak and barren, and is avoided by the shepherds. The tracks of these men tend to keep to the long valley bottoms, working up from Gangtok and the Lachung valley, and crossing the intervening ridges as seldom as possible. It is comparatively easy to visit any of the passes if the valley routes are followed, but to cross from pass to pass along the boundary is very difficult and not advisable with laden men, though the heights are not great as compared with those in other parts of Sikkim. As elsewhere it is the Rhododendron scrub which deters one from attempting apparent short cuts from one valley to the next.

Dikchu Valley and Chamnago.

Returning on the 19th to Changu we arranged our collections and made preparations for the journey to the Dikchu valley. The slight track above the bungalow leads over the ridge which rises to above 13,000 feet, and there follows a dip into a valley with a fairly large stream, as far as I could find out, without name. Then comes a long ascent to 14,000 feet to a long ridge which is much favoured by the shepherds, as several of their 'gôts' were found there. One or two stone huts are on the ridge, a sign that it has been for long a regular summer station of these men. *Primula Wattii* was here fairly abundant. Beyond was dense Rhododendron forest sloping steeply to the Dikchu. This stream in the rains is a rapid torrent even at 12,000 feet and the temporary bridge erected by the shepherds is a rickety structure of poles without handrail and forms an unpleasant hazard in the day's march, especially when a heavy shower brings it level with the water. After crossing we ascended the right bank to Chamnago, where we camped about 12,500 feet. The ground is everywhere a temporary marsh at this season but the traveller will find a convenient triangle of ground for a camp just where the stream forks.

The valley is much narrower than the Nathui La valley with very precipitous sides. The road is merely a track which a moment's inadvertence is sufficient to lose. *Abies Webbiana* is the common tree. Except Juniper I saw no other conifers. The next day we ascended the Chola by the narrow steep path. There is little grazing ground. Above 13,000 feet, the path is very rocky. The pass is 14,700 feet high, slightly higher than the Nathui La and with similar vegetation.

On the following day we descended the Dikchu to Fieungong *Lilium roseum* was found sparingly. The 24th was given to the ascent of the Yakla. Rain fell all day and the march was eminently disagreeable, about a score of swollen streams having to be forded. Botanically none of these passes are worth a special visit as the hills in the vicinity of Changu provide in greater profusion all that is to be found at the passes. The number of shepherds' clearings in the Dikchu valley is very limited and makes no appreciable difference to the mass of Rhododendrons. If it were not for their narrow tracks and rough bridges, these areas would be impossible to traverse without a party of pioneers to clear the way. These clearings give an opportunity to many plants which otherwise would be overwhelmed by the Rhododendrons.

The next two days were spent at work in the valley. The most interesting plant obtained was a red flowered *Saxifraga* (*S. Gageana* sp. nov.). Here also was found a species of *Caragana* the first leguminous plant I had seen on these ranges. This absence of *Leguminosæ* is remarkable as at the same elevation in the drier north *Astragali* with allied genera abound while in the equally wet south-west *Piptanthus* at least is common.

The Chakung Chu Valley.

On the 29th we struck north to the Chakung Chu and marched amid a downpour to the morass which was our camping ground. It was fair for the first time in the month from two to six o'clock in the afternoon. This event transformed our camp and cheered us with the hope that another ridge between us and the rains might give us better weather.

Our finds in this region included *Meconopsis bella,* hitherto recorded only from one spot near Megu in Western Sikkim, and *Saxifraga odontophylla,* new to the East Himalayas. It is noteworthy that of the many species of *Saxifraga* known from the Himalayas, all with one or two exceptions appear in Sikkim.

The Chakung Chu takes a precipitous course to the Tista which it reaches ultimately near Tong. About one mile of its course is decked by luxuriant plants of *Meconopsis napaulensis* DC. One fine specimen had 224 flowers and flower buds and stood over 7 feet high. A new *Saxifraga* (*S. pluviarum*) was found on the higher ridges about 14,000 feet.

The next few days were spent in exploring the ridges and slopes of Gaoring and the Chakung valley. The flora is that of the Dikchu valley, but as the area is not quite so exposed to the rainstorms, there is an approximation to the drier Lachung flora. On August 4th we crossed the north affluent of the Chakung Chu and ascended the ridge known as Ningbil which rises to about 15,000 feet and affords an extensive view of the whole of the Sikkim Himalaya from the Singalela in the west to Donkia and Tanka La in the east. The slopes from Ningbil to the torrent known as the Ong Chu are very precipitous and covered with dense rhododendron wherever the slopes are less abrupt.

We had a long search for a gap in the rampart of rock and the only available gorge required a mile of cutting through the scrub to make it practicable. Near a deserted shepherd's camping ground below Ningbil we came across, at 13,000 feet, plants of *Circæaster agrestis,* a rare plant found in the Kumaon hills and also in Tibet and West China. Its small hooked fruits no doubt explain its occasional presence in the vicinity of the sheepfolds.

The area here is undoubtedly less wet receiving about half the rainfall of the outer Chola ridges. Instead of the rain arriving at 8 or 9 A.M. as is the average at Changu and Dikchu, we usually escaped until noon. The chief difference in the vegetation was the almost entire disappearance of the large species of *Senecio* which were so characteristic of the Chungu area.

We spent two or three days at Ningbil and the Ongchu ridges. We bridged the Ongchu and made several attempts to reach the Tanka La from this side but without success.

Gnatong and Dzalep La.

By the 10th we had returned to Changu and after obtaining later stages of the Changu and Laghep flora, marched by way of Kapoop to Gnatong. The opportunity was taken to visit the Dzalep La, the flora of which closely resembles that of the passes to the north. The immediate neighbourhood of Gnatong is of comparatively little botanical interest. The forest of *Abies Webbiana* which was once all round the village has been cleared, and the common weeds of the district occupy the space. By the streams are large plants of *Mandragora caulescens* from two to three feet high, much more robust than the specimens seen near Changu. The calyx in fruit is an inch and a half long, and the fruit over two inches in diameter.

We visited the source of the Gnatong Chu and of the Dikchu, and the boundary hill, Gipmochi, without finding any very good botanical ground. Some miles of the Gnatong Chu which we traversed on the 18th yielded a beautiful *Codonopsis* which frequents the precipitous banks. On the 19th we reached Phadonchen where we spent a day examining the forest flora between 5,000 and 9,000 feet. Hosts of leeches at this season render this area disagreeable to explore. The lower valleys by Ari and Rhenock are interesting but present no botanical features new to those who have visited the opposite slopes of Pedong and Kalimpong.

Weather.

The summer of the Chola Range is a short one and very wet, corresponding to that of the Singalela Range. I kept a rough record of the last 28 days of July and the first 20 of August. July I spent on the outer and more exposed ridges, August chiefly on the inner. Reckoning from 6 A.M. to 6 P.M., I find that :—

For July—

On 7 days	rain all day.
11 „	fair for two hours on average.
6 „	„ „ five „ „ „
4 „	„ „ eight „ „ „

For August—

1 day	fair for two hours.
13 days	„ „ six „
5 „	„ „ eight „
1 day	„ „ ten „

In the record there is no day but showed some rain. Heavy downpours were the exception in the upper areas where there was usually a steady drizzle. August in the outer ranges was as wet as July and the contrast in the records of the two months brings out very well the gradual lessening of the daily rainfall as the inner ranges were reached. Most of the spurs run east and west and each in succession takes its quantum from the southern rainclouds. One's position in the area could almost be defined during these months by the time the morning rain arrived—the more northerly, the later the rain. Considering the limited amount of sunshine and the scarcity of the ordinary insect visitors, the number of brightly coloured flowers is high. As has been aptly noted by Gammie (Sikkim Gazetteer, 1894, page 109), these brightly coloured flowers are of the types most favoured by bees which are the most usual visitors at these altitudes, other kinds of insects being comparatively rare.

Homogeneity of the Flora.

The flora of the Chola Range between 10,000 to 15,000 feet is very homogeneous and only in the northern area is there a gradual transition to the flora of a drier region. The transition proceeds *pari passu* with the succession of ridges running more or less east and west. As already pointed out, the comparatively low general altitude of the range with the absence of lofty protecting ridges, tends to restrict any tendency to diversity.

In its general features there is a similarity to the flora of the Singalela Range, but the latter with its extensive alpine meadows protected by very lofty ridges is somewhat more prolific in individual species.

The short vegetative season is one of mist and rain. This in conjunction with the low temperature is conducive to the formation of an acid soil. The result is a vegetation which is in many aspects xerophytic.

Of this the Rhododendrons are the most striking example with their tough evergreen foliage in many instances covered with ferruginous wool or with glands and hairs, or with a glaucous waxy coating ; the fleshy corollas are another character. In the subalpine tract they form in great part a forest with a general vegetation level of 20—30 feet, altitude 8—10,000 feet ; from 10—12,000 feet, a bush with an average level of 6—10 feet, and in the upper altitudes to 15,000 feet, a heath of prostrate forms which do not usually rise above 2 feet. The regularity of the diminution of these Rhododendrons with the altitude is noteworthy. Mr. George Forrest who has collected much in Western China (Yunnan), where the specific concentration of the genus is morem arked than even in the East Himalaya, has shown me photographs illustrating the general habit of the Rhododendrons in that region and there the smaller species appear to intermingle much more freely with the bush and tree types and frequently occur below them. Neither in that area, which is much less moist, does the genus appear to be so antagonistic to other genera.

The preponderance of Rhododendrons induced by the climatic factors is no doubt a reason for the comparative absence of variety in herbaceous plants. This has been suggested by Gammie in the Sikkim Gazetteer, 1894, page 102. Shrubs of other genera such as *Berberis, Pirus, Salix* are much less prominent and rarely succeed in monopolising even a small area. Notwithstanding the prevalence of the Rhododendrons, they appear to be slow in reconquering any area from which they have been ejected and the shepherds seem to have little difficulty in keeping their pastures from being overgrown.

Further among the conditions favouring a flora of a restricted character is the homogeneous geological formation. The rocks in the alpine area are chiefly gneissose with little of the micaceous schist which is so conspicuous in the Darjeeling district. I saw no indication of limestone.

Other factors which help to explain the homogeneity are the covering of snow which prevails for the greater part of the year and shortens the vegetative season, the regularity of the moist south winds with frequent mists during that period, and everywhere the steep slopes which are quickly denuded and are usually but sparely covered with soil.

Dominant Orders, Genera and Species.

The dominant orders are *Ericaceæ, Primulaceæ, Compositæ, Crassulaceæ, Saxifragaceæ, Rosaceæ ;* and in a less degree, *Ranunculaceæ, Caryophylleæ, Juncaceæ, Cyperaceæ, Gramineæ, Scrophularineæ, Gentianaceæ, Salicineæ.*

The dominant genera are :—*Rhododendron, Primula, Senecio, Sedum, Saxifraga Potentilla, Gentiana, Pedicularis, Salix, Swertia, Meconopsis,* *Ranunculus, Anemone,* and in a less degree, *Juncus, Corydalis, Rheum, Codonopsis, Parnassia, Arisæma.*

The dominant species are :—*Abies Webbiana, Clematis montana, Chrysanthemum Atkinsoni, Senecio Kingianus, Senecio Mortoni, Swertia Hookeri, Gentiana stylophora, Rhododendron campanulatum, Primula sikkimensis, P. reticulata, P. obtusifolia, P. Stuartii, Trollius pumilus, Meconopsis paniculata, Iris Clarkei, Cardamine macrophylla, Lloydia serotina.*

The following are absent, or at least not recorded from the S. E. area :—*Anemone vitifolia, Adonis, Callianthemum, Isopyrum, Hypecoum, Arabis, Tamarix, Coriaria, Oxytropis, Thermopsis, Piptanthus, Deutzia, Philadelphus, Scabiosa, Leptocodon, Pyrola, Ephedra, Picea, Tsuga, Larix; Draba,* the tufted *Arenariæ, Astragalus, Saussurea, Lactuca, Crepis,* are scantily represented.

Protected Flowers.

The character of the climate suggests the need of protection to the flower-organs. There was a profusion of bell-shaped and drooping flowers. In addition to the numerous species of *Rhododendron, Rosa sericea* showed inverted flowers ; while the flowers of *Swertia Hookeri, Gentiana stylophora, Primula* sps., *Meconopsis* sps., *Geranium* sps., *Codonopsis* sps., *Cyananthus, Fritillaria* sps., *Lloydia,* the nodding *Cremanthodia, Senecio* sps., *Cassiope, Enkianthus, Geum elatum, Pedicularis* sps., *Aconitum, Corydalis, Lagotis,* were all fairly secure by structure or position against the downpour.

Isolated Species.

The flora of Sikkim is remarkable for the isolation of many of the species. The physical features of the country, the deep valleys and the sterile mountain ridges are the chief causes of this. Hooker has pointed out in his Himalayan Journals the isolation of even distinct floras such as the temperate flora of the Lachen-Lachung area. The broad belt of Rhododendrons no doubt plays its part in keeping the areas distinct. In all probability many of these unique species will be found to occur in the adjoining parts of Bhutan, Tibet and Nepal, when these come to be known botanically. *Rodgersia pinnata* occurs in one spot only in the North Chakung Chu valley ; it has been found in the Chumbi Valley, and then there is a gap until we reach Western China. As examples of such isolations in the Chola area we may mention *Calathodes, Meconopsis bella, Cathcartia lyrata, Geranium refractum, Senecio Kingianus, Senecio Chola, Saussurea Laneana, Primula Elwesiana, Primula Wattii Swertia Burkilliana.*

Transition to Tibetan Flora.

It has already been noted that the change in the flora as one proceeds northward is a gradual one in the Chola Range. This is in striking contrast to the Singalela and the area lying to the north of it. The two ridges on either side of the Zemu are so uniformly high and unbroken by any southward-tending valley that the aspect of the flora to the north (Llonakh) is quite Tibetan. In the Chola the ranges are lower and are much divided by lateral valleys so that the change to the conditions of Lachung and the Donkia (though these are ultimately quite Tibetan) does not appear so abrupt.

New species from the area.

The following are the new species collected on the tour:—
Paroxygraphis sikkimënsis, *Draba cholaensis*, *Arenaria Balfouriana*, *Potentilla microphylla* Don, var. *pusilla*, *Saxifraga Gageana*, *Saxifraga pluviarum*, *Trachydium affine*, *Leycesteria Belliana*, *Senecio biligulatus*, *Senecio Kingianus*, *Senecio Lagotis*, *Senecio Chola*, *Saussurea nimborum*, *Saussurea Laneana*, *Gentiana pluviarum*, *Swertia ramosa*, *Swertia Burkilliana*, *Pedicularis siphonantha* Don, var. *prostrata* Bonati, *Pedicularis sikkimensis* Bonati. Two species of *Juncus* may prove to be undescribed species but they require fuller investigation and comparison with ampler material of the genus.

General Survey of the Alpine Flora.

The sub-alpine area, 8—10,000 feet above the region of oaks, maples and laurels, presented a nearly uniform level of mixed forest from 20—40 feet high, broken only by the tall *Abies Webbiana*. Rhododendrons formed a large part of this, especially at the upper limit. The zone above 10—12,000 feet consisted chiefly of *Pirus*, *Salix*, *Viburnum* and again a majority of Rhododendrons, shrubs rarely exceeding 15 feet in height, though in sheltered areas the *Abies* reappeared. In this zone meadows became more prominent but were never extensive. The zone above 12,000 feet was partly a kind of 'heath' formed by the smaller species of *Rhododendron* and *Salix* and partly subglacial fell-field with a mixture of herbaceous species. In this region annuals were few and bulbous and tuberous species only sparingly represented by *Codonopsis*, *Mandragora*, *Cortia*, *Cochlearia scapiflora*, *Arisæma*, *Habenaria*, *Polygonatum*, *Allium*, *Fritillaria*, *Lloydia*. Towards the ridges the density of vegetation fell away very rapidly and the chaotic masses of bare rocks at the top sheltered only a few hardy forms such as *Chrysosplenium* *carnosum, Primula tenuiloba, P. muscoides* and *Polygonum nummularifolium.* True chasmophytic vegetation was scarce; the most noteworthy species were *Corydalis lathyroides, Meconopsis bella, Potentilla eriocarpa, Primula Gambeliana, Primula soldanelloides.*

Ranunculaceæ were represented chiefly by *Anemone, Caltha, Trollius* and small *Ranunculi.* These occurred in large numbers wherever there was any approach to meadow conditions. Aconites were apparently much scarcer than in Western Sikkim. Of *Berberideæ, Decaisnea* frequented the moist woods just below 9,000 feet while *Berberis macrosepala* was a trial to travellers on the higher slopes. *Meconopsis* was plentiful and there were several prolific species of *Corydalis. Cruciferæ* were not well represented; *Cardamine* sps., *Cochlearia* sps., *Draba elata,* being the most conspicuous. The almost entire absence of cultivated land precludes many wide-ranging species usually associated with agriculture. Of *Caryophyllaceæ* the region yielded chiefly species of *Stellaria* and *Arenaria,* mostly straggling forms typical of moist alpine conditions and very different from the "rosette" plants of those genera in northern Sikkim. *Leguminosæ* were almost entirely absent *Rosaceæ* were represented chiefly by species of *Potentilla* while *Rosa sericea* and *Geum elatum* were common. *Saxifraga* showed many species though not quite so many as in northern Sikkim. This is also true for *Crassulaceæ,* prolific in individuals but restricted in species. *Umbelliferæ* showed more species than in Northern Sikkim but fewer than in the Singalela Range. Both *Caprifoliaceæ* and *Rubiaceæ* were poorly represented; the dearth of species of *Lonicera* is noteworthy. Of the abundant *Compositæ* the most conspicuous were species of *Senecio* of which three are new. *Rhododendron* and *Primula* were the most prevalent genera in the area. *Gentiana* and *Swertia* were also well represented. *Boragineæ* were scarce with the exception of *Paracaryum glochidiatum* and *Onosma Emodi.* In *Solanaceæ, Mandragora caulescens* was the only common plant. As elsewhere in Sikkim, *Pedicularis* was well represented while *Veronica* was not uncommon. In the moist forest *Utricularia* was frequent—two species were found above the forest zone. *Labiatæ* were not common, the most conspicuous members being *Dracocephalum speciosum, Phlomis* sps., and *Calamintha umbrosa.* Species of *Polygonum* were common. *Euphorbiaceæ* and *Urticaceæ* were scarce. Prostrate *Salices* were abundant and in the valleys formed a few bushes of fair height. Among *Monocotyledons, Orchis* and *Habenaria* were frequent; extensive circular areas of *Iris Clarkei* were prominent in the moist valleys, and *Lloydia* was everywhere. *Arisæma* was prominent in both temperate and alpine areas. *Juncaceæ* and *Graminæ* were practically as numerous as in other alpine Sikkim areas.

In the alpine regions ferns were scarce. In the forests around Karponang and Phadonchen they were abundant but my record of species from the sub-temperate area is anything but complete.

Seed-collecting in October.

The native collectors returned to the area in October to collect seeds chiefly those of Rhododendrons for cultivation in Darjeeling and for exchange with botanic gardens in temperate regions. Towards the end of the month Mr. G. H. Cave, Curator of the Lloyd Botanic Garden in Darjeeling, paid a visit to Changu, to inspect the work of the men and to obtain seeds of such species as are apt to be overlooked by the Lepcha collector. He traversed the same route but on arriving at the Chakung Chu, it was found impossible to return by the same path, and an attempt which proved successful was made to reach Tong by descending the valley to where the stream joins the Tista. The following notes furnished by Mr. Cave on the country and the aspect of the vegetation at the beginning of November will be of interest as showing the difficulties of seed-collecting in November on the high Himalaya :—

"Arrived Lagyep October 26th, and after examining and packing the specimens collected by the men, left next morning for Chamnago. Hillmen on the Laghep road had reported that the passes, even the Kangralamo, were still unsnowed or with only light snow. At Chamnago a Chumbi yak-herd was making preparations for departure next morning. He was the last inhabitant, all the others having already gone to winter quarters in the lower valleys.

On the 28th, while the coolies marched towards the Chakung Chu, I paid a visit with two men to the Cho La for seeds of Primula and then followed the route taken by the coolies. Snow fell as we ascended the Doplandim Pass and on the other side it lay thick, making the descent difficult. We pitched on the same site as the August camp and experienced an exceedingly bitter night. Milk in a bottle and water in a glass both froze solid in the night inside the tent. We were snowed up at day break but the morning was fine and the snow melting rapidly we set off up the next pass, though going up and across the ridges was slow and difficult work. We reached the pass about noon and then the snow-clouds gathered thickly again and it became almost dark. Once over the pass it was worse. The snow lay waist deep and hid rocks and shrubs alike. In the steeper parts steps had to be dug for each foothold of the coolies and help given with their loads. In places we formed a line and passed the things from hand to hand. A descent was made to the beginning of the trees (Pines and Rhododendrons) and in the shelter of a large 'ordar' (leaning rock) we spent the night, the men at once forgetting their sufferings in a hearty meal and copious tea.

It snowed all night and all the next day (30th October). We descended the north branch of the Chakung Chu as the Lepchas said they had heard of a path from there to Tong. To go back over the passes when it was still snowing was impossible. We did not find the path, which was possibly under the snow, but we found traversible ground till noon, when the banks began to grow precipitous, and the river a series of falls. The snow lay at 11,000 feet and below that level the drizzling sleet formed an icy coat on everything. Late in the afternoon we came to a large 'slip' and found the river hemmed in by sheer cliffs, that on the right being so precipitous and smooth that there was no hope of passing it, while the river ran deep along its base. Cutting trees we made a rough bridge and by means of a rope crossed the river and climbed up the cliffs on the other side, by holding on to the vegetation growing in the niches of the rocks; there was no soil. Here we were scarcely in better case and just at dark found a small ledge on which we could sleep and camped there in a fashion. With alternations of sleet and snow we passed a miserable night; in the morning the frozen tents stood erect after their poles were removed. We left the tents as they were and started to look for a way out. The men were decidedly against going back over the last pass. I was for trying to scale a 'chimney' which fissured the rock just where our camp was and see if we could cross the ridge and get to the S. Chakung Chu. On each side of the river the rocks rose in sugar-loaf form, all the upper parts being quite bare. But the men preferred to go along the cliff ahead and we went slowly on, hammering pegs into fissures, cutting down shrubs, and tying notched poles horizontally along the cliff side with roots and climbers to make a way. There was little soil except a treacherous coating of soaking leaf-mould on the steep slopes overhanging the river gorge. There was rain or sleet all day and a dense mist lay over everything. Late in the afternoon we reached a ridge from which we could hear fitfully the noise of a stream to the south-east which we hoped would be the upper Chakung Chu. We waited for some time to see if the mist would clear and give us a look ahead, but we had to retrace our steps without a view and in the absence of suitable camping ground, had to make the best of our previous night's uncomfortable niche.

The morning of the first November found us stiff and sore with the exertions of the previous day, more especially from the work of hacking branches and cutting down trees. Fortunately the snowstorm was over for a time. Besides food, rugs and the specimens our only baggage was the small tent which I offered to abandon. But the men were in good heart and took everything, carrying the loads however without 'kokuns' (side shoulder lines) and not using the 'numlor' (head-strap). We went slowly over our pegs and notches of the previous day, the loads having to be passed piecemeal at the more awkward places. By noon we reached our ridge and still faced a dense mist and heard no sound of the northern Chakung Chu. Four of us climbed into a tall *Rhododendron Hodgsoni* and sat for nearly an hour waiting for a temporary clearing of the mist. Then for a few minutes we had a view which was both cheering and magnificent. Magnificent because in a terrific gorge was the junction of the two Chus and the united river going west, the whole shut in by three tremendous cliffs. Cheering because the belt of forest between us and the upper (north-east) Chakung Chu looked to be traversible as indeed it proved to be. The men ran down the steep forest slopes and camped quite happily a long way above the junction of the two streams. Before nightfall one of the men crossed on a fallen tree and found the remains of an old path on the other side.

In the morning we had to wait some time to get the tent sufficiently thawed to fold up but got across the stream by 9 A. M. The slender path took us up to 13,000 feet where we lost it in the snow but not before we reached a peak where we could see the Tista river and Cheungtong bungalow as well as the whole country from Chakung Chu to Sandakphu. Two other paths were tried, both evidently tracks of the kustorah (muskdeer) hunters, but these also ended in a blank. As we were surrounded by snow and precipices we followed a small watercourse till we got clear of the snow and some time after dark found a rock which gave no shelter but was dry at the base. Here we piled up dead bamboos (Maling) for fuel and in the morning continued our way down. Another tract ended abruptly but by now we were near enough the Tista to cut our way to Tong bungalow. The forest here is full of leeches but a good botanizing ground.

The men throughout behaved admirably and no permanent ill-effects resulted from their exertions."

Aspect of Alpine Flora in October.

"The chief impression received during a tour in late October and early November along the Cho-La range was the rapidity with which the alpine vegetation prepared for winter."

Frost had already "scorched" the grass and most of the herbage. Annual plants were mere dry sticks. Almost the only green leaf was that of an Umbellifer (*Trachydium* sp.) of small size. *Saxifraga* sp., *Gentiana amoena*, and a stray *Erigeron multiradiatus* were the only plants in flower.

Notwithstanding the winter aspect of the vegetation, however, the seeds of scarcely any species were entirely shed, those of the great majority of plants were shed only to a partial or small extent, and again others were quite unripe. The following had shed all or almost all their seeds:—*Anemone vitifolia* ; (some heads of seed were noticed still keeping their spherical form, although quite separated at the base from the old flowerhead and the sphere somewhat expanded) ; *Corydalis* sps., *Meconopsis bella, M. simplicifolia, M. paniculata, M. horridula*; (in all cases some seed remained in the lower part of the capsule of the Meconopsis;) *Cathcartia villosa*—the same; *Primula obtusifolia, Pedicularis* sps., *Swertia* sps.; *Oxyria digyna* and *Rheum acuminatum* had lost seeds, although the majority of the *Polygonaceæ* were still unripe; some of the *Compositæ ;* the majority of the *Cruciferæ, Lloydia serotina.*

The seeds of practically all the rest of the plants were still unshed, although in many cases the stems were dry and the seed rattling in the capsules—this was noticeably the case with the Aconites.

Some perennial plants had made up the "bud" on the apex of the crown for the winter, as in the case of some of the Saxifrages and *Parnassia* (the large *Saxifraga purpurascens* in particular), many of the *Compositæ, Rheum acuminatum, R. nobile, Iris Clarkei,* etc. Others had developed 'rosettes' of young leaves, lying more or less curled over each other towards the centre, and quite distinct from the old withered leaves outside; examples of this were:—*Anemone obtusiloba* and *A. rupicola ; Meconopsis paniculata* and *M. nepaulensis ;* these were 6 to 8 inches across and the leaves densely villous ; *Cortia Hookeri ; Primula sikkimensis, P. obtusifolia,* the crown almost hard and leafless enough to call a bud ; *P. Stuartii, P. petiolaris ; Bryocarpum himalaicum.*

Others again had the small growths, with very small but fully developed leaves, clustering round the old stems as:—*Inula Hookeri, Erigeron multiradiatus, Polygonum campanulatum, Euphorbia sikkimensis.*

The tops of tuberous and bulbous plants were as a rule quite dead, in some cases dry, in others mucilaginous. No seedlings from seed of current season were seen, although in cases the seed of the same plants grown on the rockery at Darjeeling gives quite stocky little plants before the end of December.

Rhododendron seeds were collected from about 14 species and all except three of these were amongst the snow, the smaller plants being almost buried in it. The capsules had not begun to split however, except in the case of *R. campanulatum, R. campylocarpum, R. cinnabarinum, R. Wightii, R. Hodgsoni* (at a lower level).

When the capsules of the other species were fractured they were found to be almost dry, woody and brittle, and the seeds themselves ripe. The capsules were therefore gathered, tied loosely in large bags of thin cloth and on arrival at Darjeeling these bags were daily laid in a sunny spot till the capsules opened naturally, as they did in about a month.

In this way were obtained seeds of *R. anthropogon, R. arboreum, R. camelliæflorum, R. glaucum, R. lepidotum, R. Maddeni, R. setosum, R. Thomsoni.*

I am of opinion that if the whole capsules are gathered early in November, and treated as noted above without any attempt to open them by artificial heat, that most of the seeds will be good. *Rhododendron ciliatum* was in bud and in some cases opening flowers on November 2nd at 13,000 feet. Plants brought to Darjeeling some years ago do not flower till February-March.

The mixed forest of 9—13,000 feet had a gorgeous appearance in consequence of the brilliant colouring of the fading leaves, the most noticeable being golden yellow—*Acer Campbelli, Acer sikkimensis,* and an Araliad; bronze—*Pirus sikkimensis;* silver gray—*Pirus vestita;* scarlet—*Pirus microphylla, Rosa sericea,* and *Acer Hookeri;* shades of brown—the Rhododendrons.

I have to acknowledge much kind assistance in the identification of my specimens. Some of the more critical species were examined in the Kew Herbarium, and I am indebted to Mr. W. G. Craib for his opinion on these. M. Bonati has dealt with the genus *Pedicularis;* Mr. I. H. Burkill with the *Gentianaceæ;* Oberpfarrer Kükenthal with the *Cyperaceæ,* and M. Hamet with the *Crassulaceæ.*

For help in the field, I owe much to the enthusiasm of Mr. Cave who has added several species to the records of the area, and to the untiring energy of Ribu and Rhomoo, the Lepcha collectors, whose record of work in the higher Himalaya is a very honourable one.

SYSTEMATIC LIST.

DICOTYLEDONS.

I.—RANUNCULACEÆ.

1.—CLEMATIS Linn.

1. **Clematis montana** Ham.
Laghep, Changu, Chola Range, 9—13,000 ft., No. 3322.
More sparingly in the north of this area.

VAR. **tongluensis.**
Dikchu Valley, 11,000 ft., No. 3829.

2. **Clematis smilacifolia** Wall.
Ari, Rhenok, 3—5,000 ft.

3. **Clematis acuminata** DC.
near Laghep, 7,000 ft.

4. **Clematis connata** DC.
Ari, 6,000 ft.

5. **Clematis Buchananiana** DC.
Phadonchen, 9,000 ft.

2. THALICTRUM Linn.

6. **Thalictrum elegans** Wall.
Laghep, Chamnago, 11—13,000 ft., No. 3803.

7. **Thalictrum Chelidonii** DC.
Chola Range, Gnatong, 11—12,000 ft., No. 3722.

8. **Thalictrum virgatum** Hook. f. & Thom.
Laghep, 11,000 ft., No. 3055.

9. **Thalictrum alpinum** L.
Fieunggong, Ningbil, 12—15,000 ft., Nos. 3876, 4086.

10. **Thalictrum javanicum** Bl.
Phadonchen, 7—9,000 ft., No. 4405.

11. **Thalictrum foliolosum** DC.
Changu, W. of Tanka La, 12—13,000 ft.

3. **Anemone** Linn.

12. **Anemone rupicola** Camb.
Above Changu, 14,000 ft., No. 3535. Rare.

13. **Anemone vitifolia** Ham.
Lower Chakung Chu towards Keadom, 7,000 ft.
Only in the drier region.

14. **Anemone Griffithii** H. f. & T.
Changu, 12,000 ft., No. 3138.
Rare. This is a tall form differing much in habit from the 8—9,000 ft. plant

15. **Anemone obtusiloba** Don.
Changu, Chola, 11—14,000 ft., No. 3079. Sparingly.

16. **Anemone rupestris** Wall. nec F.B.I.
Changu, 12—14,000 ft., Nos. 3099, 3179, 3561.

A dwarf form very common in the area, scarcely one inch high. Root almost bulbous. Plant nearly glabrous with petals white above, bluish below ; stamens with very broad, almost elliptic filaments, and ovaries glabrous.

17. **Anemone trullifolia** H. f. & T.
W. of Changu, 12,000 ft., No. 3279.

18. **Anemone rivularis** Ham.
Near Lachung, 9,000 ft., No. 3341.

19. **Anemone demissa** H. f. & T.
Changu, Chola, Dzalep La, 12—15,000 ft., Nos. 3455, 3677.
VAR. **monantha** Brühl
Near Tanka La, 15,000 ft., No. 523 *Gammie* !

20. **Anemone polyanthes** Don.
Lachung, Changu, Chola, 12—14,000 ft., Nos. 3098, 3177, 3317, 3694.
Very common and very variable in colour throughout the area.

4. **Ranunculus** Linn.

21. **Ranunculus Cymbalariæ** Pursh.
Laghep, Changu, Tanka La, 12—14,000 ft., Nos. 3144, 3294, 3304, 3594.

22. **Ranunculus pulchellus** C. A. Mey.
Lingtu, Lachung, 10—13,000 ft.
The var. *sericea* I did not see in the moist region.

23. **Ranunculus lobatus** Jacq.
Chola range, 16,000 ft., No. 820 *Gammie*!

24. **Ranunculus hyperboreus** Rottb.
Nathuii La, Chola, 13—15,000 ft., Nos. 3399, 3454, 3914.

25. **Ranunculus affinis** Br.
Changu, Dzalep La, Gnatong, 12—14,000 ft., No. 3278.

26. **Ranunculus hirtellus** Royle
Changu, Karponang, 9—13,000 ft., Nos. 3070, 3176, 3177.

27. **Ranunculus nivalis** Linn.
Tanka La, 16,000 ft., fide *Hooker f.*

28. **Ranunculus diffusus** DC.
Karponang, Changu, 7—11,000 ft., No. 2971.

29. **Ranunculus flaccidus** H. f. & T.
Karponang, Changu, 9—12,000 ft., No. 3178.

5. **Oxygraphis** Bunge

30. **Oxygraphis polypetala** H. f. & T.
Changu, Lingtu, 12—13,000 ft., Nos. 3196, 3286.

I did not find *O. glacialis* Bunge in the area; it occurs to the north in the drier ranges.

6. **Paroxygraphis** W. W. Smith. Genus novum.

Habitus *Oxygraphidis perpusillæ* sed flores dioici. Structura floris cum *Oxygraphide* non quadrat. Ab *Hamadryade* habitu, sepalis persistentibus, quinque petalis inconspicuis satis distinctum. Species unica.

31. **Paroxygraphis sikkimensis** W. W. Smith, sp. nov.

Planta nana plus minusve 1 cm. alta, perennis, acaulis, glabra, scapo unifloro; plantæ multæ in glebam parvam congestæ. *Radicis* gracilis corona squamis ovato-acuminatis et foliorum reliquiis obtecta. *Folia* 2—10, omnia radicalia, ad 1 cm. petiolata; lamina minima, 1 mm. longa, fere 1 mm. lata, late ovata, cordata, coriacea, integra. *Scapus* solitarius, 5—7 mm. longus, erectus. *Sepala* quinque, oblonga vel obovata, apice rotundata, 3 mm. longa, subcoriacea, persistentia, 3-nervia. *Petala* quinque cum sepalis alternantia, subviridia, fere translucida, discreta, in laminam 1 mm. longam fere 1 mm. latam, (folio similem magnitudine et forma) ovatam, 3-nerviam, et in unguem 1 mm. longum oblongum extensa. *Stamina* 10, in medio toro sine carpellorum vestigiis inserta, 2 mm. longa. *Carpella* 10—15, in planum torum laxe inserta, nec in convexum receptaculum compacta; ovarium 1 mm. longum, triangulari—ovoideum, glabrum, læve, nec striatum, stylo recto, apiculato, persistente, 1 mm. longo. *Ovulum* singulum a basi cavitatis adscendens. *Achenia* matura disjuncta ecalyce persistente facile delabuntur.

Sikkim :—In the wetter ranges at 12—14,000 ft., near Changu bungalow, in the Dikchu valley, in the Chola Range below the Tanka La, Nos. 3204, 3318, 3359, 3635, 3864, *Smith*; at Jongri, No. 139 *Gammie* ! and in Kew Herbarium, *Watt* !

7. Caltha Linn.

32. Caltha palustris Linn.

Changu, 10—13,000 ft., No. 3263. Common.

33. Caltha scaposa H. f. & T.

Changu, Gnatong, 10—12,000 ft., Nos. 3071, 4545. Very common.

8. Calathodes H. f. & T.

34. Calathodes palmata H. f. & T.

Dickchu Valley, 10,000 ft., *Gammie* !

I did not observe this rare plant.

9. Trollius Linn.

35. Trollius pumilus Don

Changu, 11—12,000 ft., Nos. 3056, 3297.

Very common.

10. Delphinium Linn.

36. Delphinium viscosum H. f. & T.

No. 835 *Gammie* !

In the Flora of British India, Vol. I, p. 27, the sepals of this plant are said to be light blue. I found the sepals in my Sikkim specimens to be yellowish with the semi-transparent look of the bracts in *Saussurea obvallata*; peta's purplish with glistening bronzy hairs. This is the only *Delphinium* I saw in the area *D. glaciale* however is found at 16,000 ft. on the Donkia La, a little to the north.

11. Aconitum Linn

37. Aconitum luridum H. f. & T.

Changu, Chola, Chakung Chu, 12—14,000 ft., Nos. 4058, 4205, Frequent.

38. Aconitum palmatum D Don

Yakla, 14,000. Sparingly.

39. Aconitum spicatum Stapf
W. of Tanka La, 12,000 ft. Sparingly.

40. Aconitum laciniatum Stapf
Gnatong, Chola, Ningbil, 11—13,000 ft., Nos. 3746, 4135. Common throughout.

41. Aconitum heterophylloides Stapf
Lingtu, 10,000 ft.

II—MAGNOLIACEÆ.

12. Talauma Juss.

42. Talauma Hodgsoni H. f. & T
Phadonchen, 5—6,000 ft.

13. Magnolia Linn.

43. Magnolia Campbellii H. f. & T.
Phadonchen, 7—8,000 ft. No. 4485.

44. Magnolia globosa H. f. & T.
Tanka, 9,000 ft., *Gammie* !

14. Michelia Linn.

45. Michelia excelsa Bl.
Phadonchen, Ari, 5—8,000 ft.

46. Michelia lanuginosa Wall.
Phadonchen, 6,000 ft.

15. Schizandra Michx.

47. Schizandra elongata H. f. & T.
Phadonchen, 7—8,000 ft.

16. Kadsura Kæmpf.

48. Kadsura Roxburghiana Arn.
Cheungtong, 5,000 ft., No. 3350.

III.—BERBERIDEÆ.

17. Decaisnea H. f. & T.

49. Decaisnea insignis H. f. & T.
Karponang, Phadonchen, 7—9,000 ft., Nos. 2997, 3358.

18. **Holbœllia** Wall.

50 **Holbœllia latifolia** Wall.
Karponang, Phadonchen, 7—9,000 ft.
VAR. **angustifolia.**
Phadonchen, 8—9,000 ft.

19. **Mahonia** Nutt.

51. **Mahonia nepalensis** DC.
Karponang, 7—8,000 ft.

20. **Berberis** Linn.

52. **Berberis umbellata** Wall.
Common in the Chola Valley, 11—12,000 ft., No. 3736.

53. **Berberis Wallichiana** DC.
Karponang, 9,000 ft.

54. **Berberis angulosa** Wall.
Gnatong, 11—12,000 ft., No. 4376.

55. **Berberis macrosepala** Hook. f.
Changu, Chola, 13—13,500 ft., No. 3140.
An abundant and troublesome shrub, usually two to three feet high.

56. **Berberis concinna** Hook. f.
Chola Valley, Laghep, 11—12,000 ft., No. 3761.
Occasional.

IV.—PAPAVERACEÆ.

21. **Meconopsis** Vig.

57. **Meconopsis horridula** H. f. & T.
Chola, Gaoring, 14—16,000 ft., No. 3990.
Frequent in rocky places near the summit of the ridges.
VAR. **racemosa.**
Ningbil, 14—15,000 ft., No. 4077.

58. **Meconopsis sinuata** Prain
Changu, 12—13,000 ft., No. 3147.

59. **Meconopsis paniculata** Prain
Changu, Chola, 10—11,000 ft. Frequent

60. Meconopsis napaulensis DC. nec F.B.I.

Chakung Chu, 11—12,000 ft., Nos. 3962, 4465 *Ribu* !

In this valley grows to 5—7 ft. high, with flowers 3 in. across and occasionally over 300 on one plant.

61. Meconopsis simplicifolia Walp.

Changu, Chola, 12—14,000 ft. Common.

62. Meconopsis bella Prain

Tosa, Chakung Chu, 14—15,000 ft., Nos. 3926, 4084, 4463 *Ribu* !

A rare plant, found usually in the moist crevices of cliffs facing north.

22. Cathcartia Hook. f.

63. Cathcartia villosa Hook. f.

Laghep, Chola 9—12,000 ft., No. 3298.

Abundant at the former place.

64. Cathcartia lyrata Cummins & Prain

Karponang, Sherabthang, Dikchu Valley, 9,500—13,000 ft., Nos. 3168, 3758, 4308.

Distributed over the area but very sparingly. I have not seen more than half a dozen plants in one spot.

V. FUMARIACEÆ.

23. Dicentra Borkhaus

65. Dicentra scandens Walp. nec F.B.I.

Karponang, Phadonchen, 7—9,000 ft. Very common.

24. Corydalis DC.

66. Corydalis cashmeriana Royle

VAR. **ecristata.**

Changu, Nathui La, Tosa, Mugbil. 13—14,500 ft., Nos. 3237, 3310, 3770, 3954, 4089. Common.

67. Corydalis trifoliolata Franch.

Gnatong, 12,000 ft., *King's collector* !

68. Corydalis lathyroides Prain

Ningbil, Tosa, 13—14,000 ft., Nos. 3941, 4114.

Has a stout rootstock nearly 5 cm. long and 6 mm. thick. Old leaf-bases practically gone. Flowers 1·6 cm. long, yellow ; upper petal shortly crested, winged, with two reddish spots near apex ; spur equal in length to lamina, yellow, straight or curved downwards slightly. Lower petal exceeding upper, carinate, winged, grooved above, with two red spots below. Laterals yellow, united above.

69. **Corydalis graminea** Prain

Dikchu, Tosa, Pemberingo, 11—14,000 ft., Nos. 3715, 4072.

Roots numerous, tuberous.

70. **Corydalis juncea** Wall.

Changu, Dzalep, Ningbil, 12—13,000 ft., Nos. 4120, 4329.

71. **Corydalis flaccida** H. f. & T.

Laghep, Changu, 10—12,000 ft., No. 3384. Common.

72. **Corydalis Laelia** Prain

Changu, Chola, Dikchu, 12—13,000 ft., Nos. 4198, 4224, 4275.

Leaf segments obtuse, acute, or acuminate. Flowers one inch long, with large dorsal crest, projecting forward. Lower petal with a large projecting keel. The upper crest and lower keel project 6 mm. beyond the beak. Flowers yellow.

73. **Corydalis Casimiriana** Duthie & Prain

Kapoop, Chola, Tanka La, Nos. 4217, 4230.

74. **Corydalis longipes** DC.

Dzalep, Sherabthang, Ningbil, 12—14,000 ft., Nos. 4124, 4303, 4339.

VAR. **chumbica** Prain MSS.

Species distincta ? floribus albis (semper ?) stigmate diverso, carcare multum curvato, distinguenda.

Lieutenant-Colonel Prain, when discussing (Journ. As. Soc. Beng. LXV. p. 28) the relationships between *Corydalis Casimiriana* and *C. longipes* points out that neither of these is in the least degree variable, at all events in the direction of passing into each other. " An apparent exception to this is a solitary gathering from Chumbi which with flowers exceedingly like those of *C. Casimiriana* has unripe capsules like those of *C. longipes*. But the evidence that we have in this plant an intermediate between *C. Casimiriana* and *C. longipes* is far from complete. It flowers instead of being intermediate in form between those of the other two have a spur with an exaggerated curvature. The stigma too differs from that in either *C. Casimiriana* or *C. longipes* and resembles that of *C. tongolensis* Franchet from Szechuen, another nearly related but nevertheless quite distinct species." The plant is referred in the Calcutta Herbarium to *C. longipes* DC. var. *chumbica* but in a note on the cover Colonel Prain states that it is probably a distinct species. Without a careful study of this and its close allies I hesitate to do more than append the following field notes :—

Root weak, fibrous. *Stem* glabrous, much branched from the base. *Leaves* long petioled, almost triternate ; apices and sinuses of segments marked with a black dot *Racemes* simple elongate. *Bracts*, lower similar to the leaves, gradually becoming simpler until only trifid leaves. *Flowers* distant. *Sepals* two, fimbriate whitish scale 1 mm. broad. *Corolla* whitewitha tinge of blue, spur white with a bluish central thread ; in the original Chumbi specimens the colour is given yellow as reported by the native collector ; the anterior part of the corolla is a deep blue with a little green and still less yellow ; upper petals crested very distinctly, 1—1·2 cm. long, including spur which is strongly uptilted, obtuse ; lower petal boat-shaped with a constriction in the middle, keeled distinctly ; laterals coherent. *Stamens* with broad elliptic white translucent filaments. *Style* 1 mm., filiform ; fruit immature 8 mm. long, 2·5 mm. broad, linear-oblong.

Chamnago, 12,000 ft., No. 3658. Chumbi, at Ta-Ohey Kung, No. 525 *King's collector* !

75. **Corydalis chaerophylla** DC.

Karponang, Fieunggong, Ningbil, 9—13,000 ft., Nos. 2977, 3881, 4162. Common.

76. **Corydalis geraniifolia** H. f. & T.

Lachung valley, 9,000 ft. *Gammie* !

77. **Corydalis meifolia** Wall.

Sherabthang, Yak La, 14—15,000 ft., Nos. 3573, 3776.

Flowers in a dense flat corymb with very stout pedicles one inch or less. Corolla yellow with a purple base and spur, a green band on either side of the crest and on either side of the keel. Posterior petal broad with two yellow wings and a high yellow crest ending in a very short obtuse down-turned spur, only ¼ length of lamina. Anterior petal stout with a very broad keel and purplish base. Lateral petals with linear claws, apices stout adherent ridged and crested, inner surface grooved and purple at tip.

VAR. **sikkimensis** Prain

Ningbil, 14,000 ft., No. 4214.

78. **Corydalis latiflora** H. f. & T.

Nathui La, Chola, Gaoring, 14—15,000 ft., Nos. 3486, 3682, 3988.

Petals a light blue with many minute darker blue spots. The upper and lower petals are each marked 1 mm. from the apex, by a pair of eye-like spots black behind greenish-yellow before. Posterior petal 1·5 cm., or less, ·5 cm. broad stout, firm, shortly crested, winged more, apex triangular firm ; spur 1 mm. obtuse, curved downwards. Anterior petal boat-shaped, 1·2 cm. long, with firm triangular apex. Laterals 1 cm., upper half purplish, lower bluish white, grooved sagittate in front, keeled and ridged behind, coherent at the apex by a whitish twin horse-shoe.

79. **Corydalis Stracheyi** Duthie

Sherabthang, Gnatong, Tosa, 13—14,000 ft., Nos. 3552, 3567, 3930, 4067. Common.

VI.—CRUCIFERÆ.

25. Barbarea Br.

80. **Barbarea vulgaris** Br.
var. **sicula.**
Changu, Chola Valley, 11—13,000 ft., Nos 3074, 3123, 3296, 3696

26. Cardamine Linn.

81. **Cardamine circaeoides** H. f. & T.
Lower Chakung Chu, 6—7,000 ft.

82. **Cardamine trifoliolata** H. f. & T.
Karponang, Laghep, 8—11,000 ft., Nos. 3031, 3046, 3257.

83. **Cardamine hirsuta** Linn. VAR. **sylvatica** Link (sp.)
Karponang, 7—9,000 ft. Common.

84. **Cardamine impatiens** Linn.
Lachung Valley, 9—10,000 ft.

85. **Cardamine Griffithii** H. f. & T.
Between Laghep and Changu, 11,000 ft., Nos. 3376, 3515, 4234.

Griffith's specimens from Bhutan have no flowers (F.B.I. i, p. 139). Leaflets entire or rather indistinctly trilobate. Sepals broadly elliptic to almost orbicular, 2mm. long with a fine translucent margin, somewhat erose at the apex. Petals 5 mm. long, obovate, slightly emarginate, lilac. Edible and a more delicate 'cress' than the next species.

86. **Cardamine macrophylla** Willd.
VAR. **sikkimensis.**
Changu, Chamnago, 10—12,000 ft. Very common.

27. Loxostemon H. f. & T.

87. **Loxostemon pulchellus** H. f. & T.
Changu, Chamnago, 11—13,000 ft., No. 3173.

28. Draba Linn.

88. **Draba alpina** Linn.
Sherabthang, W. of Tanka La, 14—15,000 ft., Nos. 3546, 4184.
Not common on this range.

89. **Draba elata** H. f. & T.

Changu, Nathui La, Dzalep, 11—13,000 ft., Nos. 3069, 3262, 4338. Common.

90. **Draba gracillima** H. f. & T.

Sherabthang, Changu, Tosa, 12—14,500 ft., Nos. 3094, 3441. Common.

91. **Draba cholaensis** W. W. Smith sp. nov.

Sectionis *Drabellæ* species; *Drabæ gracillimae* H. f. & T., affinis; majoribus floribus, fructu capillis albis sparse induto satis distincta.

Planta annua radice debili. Omnino habitus *Drabae gracillimae. Caules* 5—10 cm. alti, multi, filiformes, debiles, flexuosi, ascendentes, sparse albo-villosi. *Folia radicalia* delapsa (plantae graminibus intermixtae); *caulina* 1 cm. longa, 4mm. lata, remota, elliptica, sessilia, integra, sparse albovillosa, nervis obscuris. *Flores* 1—3, fugacei, remoti, racemosi, ebracteati, superiore dimidio scapi 5—10 cm. longi aphyllo, pedicellis 1—3 cm. longis, filiformibus, flexilibus. *Sepala* 3 mm. longa, ovata, obtusa, glabra, rarius subglabra. *Petala* 7—8 mm. longa, oblonga, apice rotundata, flava. *Gynæceum* 8 mm. longum, stylo 1·5 mm. longo; fructus 2 cm. longus, 1·5 mm. latus, linearis, compressus, sparse albovillosus, seminibus +20, biseriatis.

West of Tanka La, Sikkim, very sparingly at an elevation of 13,000 ft., No. 4175.

29. Cochlearia Linn.

92. **Cochlearia serpens** W. W. Smith (Rec. Bot. Surv. Ind. iv, 175).

Changu, Sherabthang, Gnatong, 11—14,500 ft., Nos. 3487, 3577, 4311, 4551. Petals dark lilac. Very common at Changu.

93. **Cochlearia scapiflora** H. f. & T.

Changu, Chola, Tosa, Chakung Chu, 13—15,000 ft., Nos. 3169, 3229, 3685, 4069, 4552.

VAR. foliis grosse obtuse dentatis, floribus albis; Tosa, 15,000 ft., No. 3981.

The *Cochleariæ* of the Alpine East Himalaya are very puzzling. In addition to the two above, there are *C. Hobsoni* Pearson from Yatung in Tibet, near the Sikkim border (Hook. Ic. 2643) and *C. himalaica* H. f. & T. collected in Alpine Sikkim by Hooker. In their typical forms all four appear distinct enough but at the higher altitudes the dwarf specimens become scarcely distinguishable. I have been long in doubt regarding the validity of *C. serpens.* Specimens were sent to Kew for comparison with the Hookerian type of *C. himalaica*, represented there by only one sheet. In the Calcutta Herbarium there is only a meagre fragment. *C. serpens* certainly does not match these type sheets. At Changu the ample material of this species aided me to note the following differences from the description of *C. himalaica*. The leaves are usually tripartite, and when not so, are ovate ; the racemes are very elongate, not short ; sepals are not persistent, are glabrous with membranous margins ; the fruits tend to be one-seeded. I did not find in alpine Sikkim a *Cochlearia* to match the Hookerian specimens of *Cochlearia himalaica* H. f. & T. *C. scapiflora* in its normal development is very distinct but shows considerable variety in the form of its leaves and in the colour of the flower ; its minute forms approximate to the dwarfs of the other two species.

30. **Sisymbrium** Linn.

94. **Sisymbrium himalaicum** H. f. & T.
Changu, Ningbil, 11—13,000 ft., Nos. 3121, 4150.

95. **Sisymbrium deltoideum** H. f. & T.
Sherabthang, Chamnago, 12—14,000 ft., Nos. 3392, 3450, 3775. Petals lilac.

31. **Eutrema** Br.

96. **Eutrema primulæfolium** H. f. & T.
W. of Tanka La, Lachung, 10—13,000 ft., Nos. 3331, 4716 *Ribu* !

32. **Erysimum** Linn.

97. **Erysimum longisiliquum** H. f. & T.
Ningbil, 13,000 ft., No. 4170.

33. **Thlaspi** Linn.

98. **Thlaspi cochlearioides** H. f. & T.
Gaoring, W. of Tanka La, 14—15,000 ft., Nos. 4004, 4220.

VII.—CAPPARIDEÆ.

34. **Capparis** Linn.

99. **Capparis multiflora** H. f. & T.
Below Phadonchen, 4,000 ft.

VIII.—VIOLACEÆ.

35. Viola Linn.

100. Viola biflora Linn.

Laghep, Changu, Tosa, 8—14,500 ft., Nos. 3181, 3291. Very common.

101. Viola Hookeri Thoms.

Karponang, 8—9,000 ft., No. 3028.

IX.—PITTOSPOREÆ.

36. Pittosporum Banks.

102. Pittosporum floribundum W. & A.

Phadonchen, 8,000 ft., No. 4647 *Ribu* !

X.—POLYGALEÆ.

37. Polygala Linn.

103. Polygala arillata Ham

Ari, Karponang, Phadonchen, 5—7,000 ft.

104. Polygala sibirica Linn.

W. of Tanka La, 9,000 ft., No. 3339.

XI.—CARYOPHYLLEÆ.

38. Gypsophila Linn.

105. Gypsophila cerastioides Don

Changu, Tosa, 11—14,000 ft., Nos. 3067, 3162, 4065. Common.

39. Cucubalus Linn.

106. Cucubalus bacciferus Linn.

W. of Tanka La, 12,000 ft., *Ribu* !

40. Lychnis Linn.

107. Lychnis apetala Linn.

Chakung Chu, Ningbil, 11—13,000 ft., Nos. 3974, 4139.

108. Lychnis nigrescens Edgew.

Gaoring, Ningbil, Gipmochu, 13—15,000 ft., Nos. 3994, 4177, 4352.

109. Lychnis himalayensis Edgew.
Changu, 13,000 ft., No. 4271.

110. Lychnis multicaulis Wall.
W. of Tanka La, 4743 *Ribu* !

111. Lychnis nutans Benth.
Changu, Chamnago 11—12,000 ft., Nos. 3659, 4252. Frequent.

41. Cerastium Linn.

112. Cerastium vulgatum Linn.
Changu, Chola Valley, 11—12,000 ft., No. 3739.

42. Stellaria Linn.

113. Stellaria sikkimensis Hook. f.
Phadonchen, Karponang, 8—9,000 ft., No. 4490.

114. Stellaria lanata Hook. f.
Laghep, Lachung, 9—10,000 ft., Nos. 3065, 3329.

115. Stellaria longissima Wall.
Lower Chakung Chu, 8—9,000 ft., No. 3349.

116. Stellaria saxatilis Ham.
Gangtok, Karponang, 6—7,000 ft., No. 2960.

117. Stellaria uliginosa Linn.
Changu, 12—13,000 ft., No. 3492.

118. Stellaria subumbellata Edgew.
W. of Tanka La, 12,000 ft.

119. Stellaria depauperata Edgew.
Changu, 11—12,000 ft., No. 4240.

120. Stellaria decumbens Edgew.
Laghep, Changu, Chola, Gnatong, 11—13,000 ft., Nos. 3523, 4360.

Frequent but not nearly so variable as in drier Sikkim.

121. Stellaria sp.
Karponang, 11,000 ft., Nos. 3038, 3084. Perhaps only a variety of the polymorphic *S. decumbens.*

43. Arenaria Linn.

122. Arenaria polytrichoides Edgew.
Nathui La, Kapoop, Chola, Ningbil, 14—15,000 ft., Nos. 3419, 3456, 3700. Sparingly.

123. Arenaria densissima Wall.
Ningbil, 15.000 ft., No. 4094. Rare.

124. Arenaria orbiculata Royle
Ningbil, 11,000 ft., No. 4212. Occasional.

125. Arenaria ciliolata Edgew.
Gaoring, Tosa, Ningbil, 14—15,000 ft., Nos. 3999, 4037, 4079.

Frequently tetramerous, with two styles. Style and filaments bluish. Sparingly.

126. Arenaria glanduligera Edgew.
Dzalep, Chamnago, 12—15,000 ft., Nos. 3807, 4327. Sparingly.

127. Arenaria Balfouriana W. W. Smith. sp. nov.

Locus mihi dubius; ob glandulas quinque quadratas staminiferas in grege *Pentadenaria* species ponenda sed habitu potius ad *Odontostemma* spectat. Sed styli tres et petala integra.

Planta perennis procumbens, laxe cæspitosa, radice longa gracili, apice incrassata. *Caules* e radicis coronā 2—6 orti, ad 10 cm. longi, debiles, prostrati, filiformes, vix nisi apud inflorescentiam ramosi, suprà glandulosis albidis capillis pubescentes, in medio nonnunquam capillis crispatis 2-lineati, basi glabrescentes, rubescentes, teretes. *Folia* linearia, 5—6 mm. longa, 1 mm. lata, apiculata, subflaccida, uninervia. *Flores* in cymas 2—6 floriferas trichotomas plus minusve re diffusas dispositi. *Pedicelli* proplanta longi, (1—3 cm.) debiles; bracteæ foliis similes vix minores. *Sepala* 5, lineari-lanceolata, 2 mm. longa, acuta, vix basi indurata, uninervia, scarioso-marginata. *Petala* 3—4 mm. longa, alba, anguste elliptica, apice rotundata, integra. *Discus* lobatus, in 5 glandulas staminiferas quadratas purpureas expansus. *Stamina* 10, biseriata, subcœrulea. *Styli* 3, subcœrulei. *Capsula* ovoideo-globosa, ut videtur 6 dentibus dehiscens; semina immatura pauca, compressa, subauriformia.

Sikkim:—In the region of heavy rains, 12—14,000 ft., near Changu and to the west of Tanka La, by the rocky banks of streams, Nos. 4222, 4246. The specific name is in honour of Prof. I. B. Balfour of Edinburgh University

128. Arenaria melandryoides Edgew.
Ningbil, Gaoring, W. of Tanka La, 14—15,000 ft., Nos. 4103, 4176. Sparingly.

129. Arenaria Benthami Edgew. *A. glandulosa* Williams.
Changu, Dikchu, Tosa, 11—14,000 ft., Nos. 3110, 3718, 3924. Common.

130. Arenaria debilis Hook. f.
Chola, 14—15,000 ft., No. 3678. Sparingly.

XII.—TAMARISCINEÆ.

44. Myricaria Desv.

131. Myricaria germanica Desv.
Lower Chakung Chu, Lachung, 9—12,000 ft. Not seen in the south of the area.

XIII.—HYPERICINEÆ.

45. Ascyrum Linn.

132. Ascyrum filicaule Dyer
Yakla, 14,000 ft., No. 3780.

46. Hypericum Linn.

133. Hypericum Hookerianum W. & A.
Phadonchen, Karponang, Chola, 7—11,000 ft., No. 3838

VAR. **Leschenaultii.**
Fieunggong, 10,000 ft.

134. Hypericum patulum Thunb.
Phadonchen, 8—9,000 ft., No. 4388.

135. Hypericum reptans H. f. & T.
Lachung, Chakung Chu, 8—9,000 ft.

136. Hypericum petiolulatum H. f. & T.
Phadonchen, Laghep, Changu, 9—12,000 ft.
Common in the valleys.

137. Hypericum japonicum Thunb.
Rhenock, Ari, 3—5,000 ft.

XIV.—TERNSTRŒMIACEÆ.

47. Eurya Thunb.

138. Eurya symplocina Bl.
Phadonchen, 6—7,000 ft.

139. Eurya acuminata DC.
Ari, Rhenock, 5—6,000 ft.

48. **Actinidia** Lindl.

140. Actinidia strigosa H.f. & T.
Phadonchen, 7—8,000 ft., No. 4488.

49. **Saurauja** Willd.

141. Saurauja napaulensis DC.
Ari, 5,000 ft.

142. Saurauja punduana Wall.
Temi, 5,000 ft., No. 2917.

50. **Schima** Reinw.

143. Schima Wallichii Choisy
Ari, 5,000 ft.

XV.—MALVACEÆ.

51. **Bombax** Linn.

144. Bombax malabaricum DC.
Ari, 3,000 ft.

XVI.—TILIACEÆ.

52. **Echinocarpus** Bl.

145. Echinocarpus dasycarpus Benth.
Phadonchen, 6–7,000 ft.

53. **Elæocarpus** Linn.

146. Elæocarpus lanceæfolius Roxb.
Phadonchen, 7,000 ft.

XVII.—LINEÆ.

54. **Reinwardtia** Planch.

147. Reinwardtia trigyna Planch.
Rhenock, 4,000 ft.

148. Reinwardtia tetragyna Planch.
Ari, 4—5,000 ft.

55. **Anisadenia** Wall.

149. Anisadenia saxatilis Wall.
Ari, 5,000 ft., No. 4503.

XVIII.—GERANIACEÆ.

56. Geranium Linn.

150. Geranium refractum Edgew. & Hook. f.
Changu, 12—13,000 ft., Nos. 3533, 4284, 4293. Rare.

151. Geranium Donianum Wall.
Kapoop, Chola, 11—13,000 ft.

152. Geranium Grevilleanum Wall.
Chola, 11—12,000 ft. Sparingly.

153. Geranium nepalense Sweet
Phadonchen, 8—9,000 ft.

154. Geranium polyanthes Edgew. & Hook. f.
Laghep, Changu, Fieunggong, 9—12,000 ft.

57. Oxalis Linn.

155. Oxalis acetosella Linn.
Changu, 11—12,000 ft., No. 4249.

58. Impatiens Linn.

A few specimens of *Impatiens* were collected and forwarded to the late Sir Joseph Hooker. They were however in too early a stage to warrant description.

XIX.—RUTACEÆ.

59. Bœnninghausenia Reichb.

56. Bœnninghausenia albiflora Reichb.
Ari, 5,000 ft.

60. Evodia Forst.

157. Evodia fraxinifolia Hk. f.
Phadonchen 7—8,000 ft.

158. Evodia rutæcarpa H.f. & T.
Lachung, 9,000 ft., No. 4730 *Ribu!*

61. Zanthoxylum Linn.

159. Zanthoxylum acanthopodium DC.
Phadonchen, 7,000 ft.

160. Zanthoxylum oxyphyllum Edgew.
Karponang, Phadonchen, 6—8,000 ft.

62. **Toddalia** Juss.

161. **Toddalia aculeata** Pers.
Phadonchen, 5—6,500 ft.

63. **Skimmia** Thunb.

162. **Skimmia Laureola** Hook. f.
Karponang, Phadonchen, 8—10,000 ft.

XX.—BURSERACEÆ.

64. **Garuga** Roxb.

163. **Garuga pinnata** Roxb.
Ari, 3,000 ft.

65. **Canarium** Linn.

164. **Canarium sikkimense** King
Ari, 3,000 ft.

XXI.—MELIACEÆ.

66. **Lansium** Rumph.

165. **Lansium decandrum** King
Temi, 6,500 ft., No. 2914.

67. **Cedrela** Linn.

166. **Cedrela microcarpa** C. DC.
Phadonchen, 6,000 ft.

XXII.—ILICINEÆ.

68. **Ilex** Linn.

167. **Ilex intricata** Hook. f.
Lachung, Phadonchen, 9—10,000 ft., Nos. 3321, 4387, 4752.

168. **Ilex fragilis** Hook. f.
Karponang, 9,000 ft., No. 3252.

169. **Ilex Hookeri** King
Phadonchen, 9—10,000 ft., No. 4433.

XXIII.—CELASTRINEÆ.

69. **Euonymus** Linn.

170. **Euonymus frigidus** Wall.
Fieunggong, Phadonchen, 8—9,000 ft., Nos. 3901, 4427.

171. **Euonymus vagans** Wall.
Gangtok, Karponang, 4—8,000 ft.

XXIV.—AMPELIDEÆ.

70. Vitis Linn.

172. **Vitis capreolata** Don
Karponang, Phadonchen, 7—8,000 ft., No. 4458.

XXV.—ACERACEÆ.

71. Acer Tournef.

173. **Acer oblongum** Wall.
Cheungtong, 6,000 ft.

174. **Acer lævigatum** Wall.
Cheungtong, Karponang, 6—8,000 ft.

175. **Acer pectinatum** Wall.
Laghep, 11,000 ft.

176. **Acer caudatum** Wall.
Changu, 12,000 ft., No. 3208.

177. **Acer Campbellii** H. f. & T.
Karponang, Phadonchen, 9—11,000 ft. Common.

XXVI.—SAPINDACEÆ.

72. Dobinea Ham.

178. **Dobinea vulgaris** Ham.
Cheungtong, Phadonchen, 6—7,000 ft.

73. Turpinia Vent.

179. **Turpinia pomifera** DC.
Cheungtong, Ari, 6—7,000 ft.

XXVII.—SABIACEÆ.

74. Meliosma Bl.

180. **Meliosma Wallichii** Planch.
Phadonchen, 8,000 ft., No. 4478.

XXVIII.—ANACARDIACEÆ.

75 **Rhus** Linn.

181. **Rhus insignis** Hook. f.
Karponang, Phadonchen, 6—7,000 ft.

182. **Rhus succedanea** Linn.
Phadonchen, 7—8,000 ft.

XXIX.—LEGUMINOSÆ.

76. **Piptanthus** D. Don

183. **Piptanthus nepalensis** D. Don
W. of Tanka La, Lachung, 8—10,000 ft. Not seen in the wetter southern area.

77. **Priotropis** W. & A.

184. **Priotropis cytisoides** W. & A.
Gangtok, Kärponang, 6—7,000 ft.

78. **Parochetus** Ham.

185. **Parochetus communis** Ham.
Phadonchen, 8,000 ft. Very occasional in the area.

79. **Indigofera** Linn.

186. **Indigofera Dosua** Ham. VAR. **tomentosa.**
Ari, 5,000 ft.

80. **Caragana** Lamk.

187. **Caragana crassicaulis** Benth.
North of Chamnago, 13,000 ft.., No. 3846. Flowers purple. The plants seen in N. W. Sikkim in 1909 had yellow flowers. Sparingly.

81. **Astragalus** Linn.

188. **Astragalus sikkimensis** Benth.
Ningbil, 14,000 ft., No. 4169. Sparingly.

189. **Astragalus xiphocarpus** Benth.
W. of Tanka La, 11,000 ft.

190. **Astragalus stipulatus** D. Don
W. of Tanka La, towards Keadom, 7—8,000 ft.

82. **Desmodium** Desv.

191. Desmodium tiliaefolium G. Don
W. of Tanka La 7—9,000 ft.

192. Desmodium kulhaitense C. B. Clarke
Ari, 3,000 ft., No. 4501. A rare species.

83. **Erythrina** Linn.

193. Erythrina arborescens Roxb.
Ari, 5-6,000 ft.

84. **Pueraria** DC.

194. Pueraria peduncularis Grah.
Lachung, Karponang, Cheungtong, 6—9,000 ft.

85. **Entada** Adans.

195. Entada scandens Benth.
Phadonchen, ascending to 7,000 ft.

XXX.—ROSACEÆ.

86. **Prunus** Linn.

196. Prunus rufa Wall.
Changu, Chola, 11—12,000 ft., No. 3207.

197. Prunus anadenia Koehne
Karponang, 9—10,000 ft.

This is the *Prunus Padus* L. of the Flora of British India. See Fedde's Repertorium, x, 34.

198. Prunus glaucifolia (Wall.) Koehne
Laghep, Fieunggong, 10—12,000 ft., No. 3880.

199. Prunus nepalensis Ser.
Phadonchen, 7—8,000 ft.

200. Prunus acuminata Wall.
Cheungtong, Lower Chakung Chu, 6—7,000 ft., No. 4769 *Ribu* !

87. **Prinsepia** Royle

201. Prinsepia utilis Royle
Lower Chakung Chu, towards Keadom. Only in the drier region.

88. **Spiræa** Linn.

202. **Spiræa Aruncus** Linn.
Karponang, Chakung Chu, Gnatong, 9—12,000 feet, No. 4377.

203. **Spiræa bella** Sims
Changu, Dikchu, 8—12,000 feet. Common.

204. **Spiræa micrantha** Hook. f.
Dikchu, 7—8,000 feet, No. 3825.

89. **Neillia** Don

205. **Neillia thyrsiflora** Don
Temi, Karponang, 5—7,000 ft.

206. **Nellia rubiflora** Don
Karponang, Chola, Phadonchen, 8—10,000 ft., No. 3001.

90. **Rubus** Linn.

207. **Rubus calycinus** Wall.
Phadonchen, Karponang, 7—9,000 ft.

208. **Rubus paniculatus** Smith
Phadonchen, 8,000 ft. Very common.

209. **Rubus moluccanus** Linn. *lato sensu.*
Karponang, Phadonchen, 7—9,000 ft. Common.

210. **Rubus fragarioides** Bertol.
Changu, Chola, 10—12,000 ft., No. 3049.

211. **Rubus lineatus** Reinw.
Karponang, Phadonchen, 8—9,000 ft. Common.

212. **Rubus Andersoni** Hook. f.
Phadonchen, 9,000 ft., No. 4424.

213. **Rubus niveus** Wall.
Karponang, Changu, Chola, 8—12,000 ft. Common.

1. **Geum** Linn.

214. **Geum elatum** Wall.
Changu, 12—13,000 ft., Nos. 3089, 3451. Common. Flowers, nodding.

VAR. **humile,** with the type, No. 3174.

92. **Fragaria** Linn.

215 **Fragaria vesca** Linn. VAR. **collina.**

Karponang, Chola, 8—12,000 ft., No. 2713.

93. **Potentilla** Linn.

216. **Potentilla Sibbaldi** Haller f.

Common throughout the area, 10—15,000 ft., Nos. 3058, 3165, 3871.

VAR. **micrantha**

Nathui La, Cho La, 14—15,000 ft., Nos. 3226, 3672.

217. **Potentilla perpusilloides** W. W. Smith

Tosa, Kapoop, Chakung Chu, 14—15,000 ft., Nos. 3417, 3575, 3666, 3944, 4020.

Fairly frequent on the Chola Range just at the limit of vegetation.

218. **Potentilla purpurea** Royle

Tosa, 14—15,000 ft., No. 3952.

219. **Potentilla sikkimensis** Prain

Changu, 13,000 ft., No. 3164.

220. **Potentilla albifolia** Wall.

Changu, 10—12,000 ft., No. 3062.

221. **Potentilla fruticosa** Linn.

Changu, Chola, Gnatong, 11—13,000 ft.

Not so conspicuous on this range as elsewhere in Sikkim.

222. **Potentilla ambigua** Camb.

Gnatong, 12,000 ft., No. 4378.

223. **Potentilla eriocarpa** Wall.

Nathui La, Ningbil, Tosa, 13—15,000 ft., Nos. 3462, 4035, 4085

224. **Potentilla Mooniana** Wight

Karponang, Changu, 9—12,000 ft., No. 2976. Common.

225. **Potentilla fulgens** Wall.

Changu, Chola, 9—12,000 ft., No. 3368.

226. **Potentilla Griffithii** Hook. f.

Lachung, 9—12,000 ft.

I did not see this species in the south-east moist region.

227. **Potentilla peduncularis** Don

Common in the Chola range, 12—14,000 ft.

VAR. **Clarkei**

Yakla, Lingtu, 12—13,000 ft.

228. **Potentilla leuconota** Don

Changu, 11—13,000 ft., Nos. 3404, 3692.

229. **Potentilla microphylla** Don

Common throughout the range, 12—15,000 ft., No. 3553.

VAR. **achilleaefolia**

Nathui La, 13,000 ft., No. 3203.

VAR. **commutata**

Changu, Tosa, Gaoring 10—15,000 ft., Nos. 3054, 3993, 4049. Stamens frequently only ten.

VAR. **pusilla** var. nov.

Nana, glabra; interdum folii costa perpaucis capillis albis adpressis instructa; folia 1—2 cm. longa; flores 1—2, fere sessiles, pedunculi 1—2 mm., sepala bracteaeque lanceolata; petala 3 mm. longa, obovata; stamina 10; achenia 20—30, receptaculo villoso.

Sherabthang, Chola 14—15,000 ft., Nos. 3481, 3909.

230. **Potentilla coriandrifolia** Don

Throughout the range from 13—14,000 ft., Nos. 3415, 3946, 4047.

In the "Flora of British India," ii, 353, the petals are described as yellow, The herbarium specimens confirm this in several instances. But the majority including all those I have collected show white petals with the lower fourth of a reddish purple.

94. **Poterium** Linn.

231. **Poterium filiforme** Hook. f.

Sherabthang, Dikchu, 12—14,000 ft. Nos. 3238, 3714.

232. **Poterium diandrum** Wall.

Changu, Chola, 11—13,000 ft. Common.

95. **Rosa** Linn.

233. **Rosa macrophylla** Lindl.

Lachung Valley, 9,000 ft. No. 3343.

Not seen in the south-east area.

234. **Rosa sericea** Lindl.

Throughout the area, 8—13,000 ft.

96. **Pirus** Linn

235. **Pirus sikkimensis** Hook. f.

Lower Chakung Chu, 8—9,000 ft.

236. **Pirus vestita** Wall.
Phadonchen, 9—10,000 ft. Common.

237. **Pirus foliosa** Wall.
Chamnago, Chola, 11—13,000 ft., No. 3141. Common.

238. **Pirus microphylla** Wall.
Throughout the area, 11—14,000 ft.

239. **Pirus Griffithii** Dcne.
Phadonchen, 8—10,000 ft.

240. **Pirus rhamnoides** Dcne.
Karponang, 9,000 ft., No. 3253.

97. **Photinia** Lindl.

241. **Photinia integrifolia** Lindl.
Phadonchen, Karponang, 7—8,000 ft.

98. **Cotoneaster** Linn.

242. **Cotoneaster frigida** Wall.
Lachung Valley, W. of Tanka La, 9,000 ft., No. 3337.

243. **Cotoneaster acuminata** Lindl.
Gnatong, Chola, 10—12,000 ft., Nos. 3762, 4375.

244. **Cotoneaster microphylla** Wall. VAR. **glacialis.**
Sherabthang, 14,000 ft., No. 3459.

245. **Cotoneaster thymifolia** Hort.
Tanka La, *Gammie*!

XXXI—SAXIFRAGACEÆ.

99. **Rodgersia** Gray

246. **Rodgersia pinnata** Franch.
North Chakung Chu, 12,000 ft., No. 4681 *Ribu*!

A very interesting discovery as it is the first record of the occurrence of the genus within the Indian area. No. 21 *Searight* from 9—10,000 ft. in the Chumbi Valley, a fragment in fruit collected in December 1904, is no doubt the same. Distribution:—China.

100. **Saxifraga** Linn.

247. **Saxifraga odontophylla** H. f. & T.
Ningbil, Tosa, 13—14,500 ft., Nos. 3940, 4066, 4075, 4467 *Ribu*!

A West Himalayan plant not previously recorded from Sikkim. Locally abundant.

248. Saxifraga palpebrata H. f. & T.
VAR. **elliptica**.
Tosa, 15,000 ft., No. 3986.

249. Saxifraga cordigera H. f. & T.
The commonest saxifrage on the Chola Range, 12—15,000 ft.

250. Saxifraga aristulata H. f. & T.
Ningbil, 14—15,000 ft., No. 4088.

***251. Saxifraga Kingiana** Engler Mss. in Herb. Calc.
Ningbil, W. of Tanka La, 13—14,000 ft., Nos. 4116, 4174.

252. Saxifraga saginoides H. f. & T.
Sherabthang, Tanka La, 14—15,000 feet, Nos. 3547, 4221.

A variety with petals scarcely exceeding the sepals, and three nerved, is also common, Tosa, Gaoring, 14—15,000 ft., Nos. 3982, 3996, 4050.

253. Saxifraga diversifolia Wall.
Changu, Chakung Chu, Tosa, 13—14,000 ft., Nos. 4015, 4060, 4269.

VAR. **parnassifolia.**
Chola, *King's collector* !
VAR. **elliptica.**
Changu, Gnatong, 12—13,000 ft., Nos. 4241, 4282.

254. Saxifraga corymbosa H. f. & T.
Ningbil, Tosa, Dzalep, 13—14,500 ft., Nos. 3939, 4083, 4219, 4326.

Not typical; usually only one flowered and yet not dwarf. Possibly a distinct species.

255. Saxifraga pallida Wall.
Sherabthang, Cho La, 12—14,000 feet, No. 3912.

256. Saxifraga micrantha Edgew.
Kapoop, Gnatong, Changu, Chola, 12—14,000 ft., Nos. 3114, 4011. Common.

257. Saxifraga ageana W. W. Smith. (Rec. Bot. Surv., iv, 265),
Ningbil, Tosa, W. of Tanka La, 14—14,500 ft., Nos. 4091, 4180 4461 *Ribu* !

258. Saxifraga pluviarum, W. W. Smith, sp. nov.
Species valde affiinis *Saxifragae pallidae* Wall., floribus minutis, bulbillis crebris distincta.

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* These sheets do not agree with *Saxifraga Kingiana* as recently published by Engler and Irusher, pages 574 and 610 of Bot. Jahrbuch, vol. 48, Heft. III & IV, 1912. q.v. [Editor.]

Saxifragae dallidae habitus. Caulis 5—7 cm., longus, flexilis, supra pubescens, infra fere glaber. *Folia radicalia* 2—3, lamina 10—15 mm. longa, 5—8 mm. lata, ovata vel elliptica, fere integra vel remote dentata, ad 1·5 cm. late petiolata; *folia caulina* nulla. *Inflorescentiae* subcorymbosae, ramuli bracteis ad 12 mm. longis linearibus rarius ovato-lanceolatis instructi; flores 1-nati, ad 4 mm. pedicellati ramulos terminantes, subnutantes, minores quame is *Saxifragae micranthae* Edgew; bulbilli 4—8, sub flore terminali in spica nascentes, ad 4 mm. bracteati, virides vel purpurei, ovoidei, 1 mm. longi, interdum 1—2 minutis foliis rotundatis instructi. *Sepala* 5, linearia oblonga, 2 mm. longa, glabra. *Petala* 5, vix calycem excedentia, anguste ovata vel obovata, alba. *Gynæceum* fere globosum, 1 mm. altum, stylis nullis.

Tosa, Chola Range, East Sikkim at an elevation of 14—15,000 ft., No. 3985.

This species is closely allied to *Saxifraga pallida* and *Saxifraga micrantha*. These two are prevalent throughout alpine Sikkim but neither in the field nor in the herbarium have I seen any bulbilliferous forms. Both are found in the same area as *Saxifraga pluviarum*, *S. pallida* ranging even higher, but the dwarf forms of each appear fairly distinct. In the Flora of British India, ii, 394 C. B. Clarke suggests that perhaps when more material accumulates *S. micrantha* will be merged in *S. pallida*. I have collected both many times in different areas and have never found a satisfactory series of intermediates. It seems better meanwhile to accord all three specific rank.

259. Saxifraga imbricata Royle

Tosa, 15,000 ft., No. 3983.

260. Saxifraga coarctata W. W. Smith (Rec. Bot. Surv., Ind. iv, 194). VAR. **elliptica.**

W. of Tanka La, 14,000 ft., No. 4186. Planta laxior; *petala* elliptica, angustiora, nec orbicularia, alba.

261. Saxifraga inconspicua W. W. Smith (Rec. Bot. Surv. Ind., iv, 194). Chola, Nathui, Ningbil, 14,500—15,000 ft., Nos. 3456, 3485, 3674, 3675, 3859, 4090.

262. Saxifraga Jacquemontiana Dcne.

Sherabthang, Chola, 14—15,000 ft., Nos. 3549, 4045.

Sometimes with the petals not exceeding the sepals.

263. Saxifraga Stella-aurea H. f. & T.

Chakung Chu, Gaoring, 13—15,000 ft., Nos. 3852, 3992.

264. Saxifraga brachypoda Don

Changu, Ningbil, Gnatong, 12—13,000 ft., Nos. 4227, 4319.

265. Saxifraga fimbriata Wall.

Ningbil, 12—13,000 feet, No. 4140.

266. Saxifraga hispidula Don

Common throughout the Chola range, 12—15,000 ft., Nos. 494, 4215, 4355.

267. Saxifraga Brunoniana Wall.

Ningbil, 13,000 ft., No. 4154.

268. Saxifraga purpurascens H. f. & T.

Changu, Tosa, 10—15,000 ft., Nos. 3122, 3928. Very common.

101. Tiarella Linn.

269. Tiarella polyphylla Don

Karponang, 9,000 ft. No. 3002.

102. Chrysosplenium Linn.

270. Chrysosplenium nepalense Don

Changu, Chola, 11—14,000 ft. Common.

271. Chrysosplenium alternifolium Linn.

Nathui La, Tosa, 13—14,000 ft.

272. Chrysosplenium carnosum H. f. & T.

Common at 13—15,000 feet, throughout the Chola range, Nos. 3171, 3686.

103. Parnassia Linn.

273. Parnassia mysorensis Heyne

Chola, 13,000 ft., No. 3913.

274. Parnassia nubicola Wall.

Changu, Chola, 11—12,000 feet.

275. Parnassia ovata Ledeb.

Common throughout the Chola range, 11—14,000 ft., Nos. 3843, 4550.

276. Parnassia pusilla Wall.

Changu, Chola, 12—15,000 ft. Common.

277. Parnassia tenella H. f. & T.

Laghep, Ningbil, 10—11,000 ft., Nos. 3380, 3416, 4210.

104. Hydrangea Linn.

278. Hydrangea altissima Wall.

Common from 8—10.000 ft., in the area.

105. Dichroa Lour.

279. **Dichroa febrifuga** Lour.
Phadonchen, 7—8,000 ft..

106. Philadelphus Linn.

280. **Philadelphus coronarius** Linn.
W. of Tanka La, Chakung Chu, 8—9,000 ft. Not seen in the moist S. E. area.

107. Ribes Linn.

281. **Ribes glaciale** Wall.
Laghep, Chola, Chakung Chu, 10—12,000 ft. Common.

282. **Ribes desmocarpum** Wall.
W. of Tanka La, 8—10,000 ft.

283. **Ribes luridum** H. f. & T.
Chakung Chu, 11—12,000 ft.

284. **Ribes Griffithii** H. f. & T.
Chamnago, 11—12,000 ft. No. 4424 *Ribu* !

XXXII.—CRASSULACEÆ.

108. Sedum Linn.

285. **Sedum Oreades** (Clarke) Hamet
Ningbil, W. of Tanka La, 12—14,000 ft., Nos. 4157, 4251.

286. **Sedum quadrifidum** Pall.
Very common throughout the Chola range, 12—14,000 ft. Nos. 3191, 3446, 3471, 3783, 3958, 4189.

287. **Sedum himalense** Don
Changu, Chamnago, Chola 11—13,000 ft. Nos. 3189, 3537, 3788. Common in the Chola range.

288. **Sedum Quevai** Hamet
Changu, 12—14,000 ft., Nos. 3190, 3489.

289. **Sedum bupleuroides** Wall.
Changu, Chamnago, Tosa, 13—14,000 ft., Nos. 3538, 3791, 4483, *Ribu* ! Common.

290. **Sedum elongatum** Wall.
Common throughout the range, 12—13,000 ft., Nos. 3188, 3543, 3701, 3887.

291. **Sedum crassipes** Wall.
Common throughout the range, 11—14,000 ft., Nos. 3578, 3790, 4016, 4506, 4582 *Ribu* !

292. **Sedum roseum** Stev.
Frequent in the Chola range, 12—14,000 ft., Nos. 3096, 3192, 3303, 3447, 3469, 3493, 4030, 4031.

293. **Sedum trifidum** Wall.
Karponang, 8—10,000 ft., common.

294. **Sedum multicaule** Wall.
Cheungtong, Lower Chakung Chu, 6—7,000 ft., No. 4774 *Ribu* !

295. **Sedum verticillatum** (H. f. & T.) Hamet
Ningbil, 11,000 ft., No. 4141.

XXXIII.—HAMAMELIDEÆ.

109. Bucklandia Br.

296. **Bucklandia populnea** Br.
Phadonchen, 7—8,000 ft.

XXXIV.—HALORAGEÆ.

110. Callitriche Linn.

297. **Callitriche stagnalis** Scop.
Karponang, 6—9,000 ft.

298. **Callitriche verna** Linn.
Chola, 11,000 ft., No. 3733.

XXXV.—MELASTOMACEÆ.

111. Oxyspora DC.

299. **Oxyspora paniculata** DC.
Ari, Phadonchen, 3—7,000 ft.

112. Sonerilla Roxb.

300. **Sonerilla Kurzii** C. B. Clarke
Ari, 5,000 ft., No. 4520.

113. Sarcopyramis Wall.

301. **Sarcopyramis nepalensis** Wall.
Common at 8—9,000 ft.

XXXVI.—ONAGRACEÆ.

114. Epilobium Linn.

302. Epilobium reticulatum C. B. Clarke
Ningbil, 12—13,000 ft., No. 4173.

303. Epilobium origanifolium Lamk.
VAR. **Balansae**.
Karponang, Changu, Chamnago, 9—12,000 ft., Nos. 2992, 3540, 3870.

304. Epilobium alpinum Boiss. (nec Linn. of F. B. I.)
Changu, 13,000 ft., No. 3520.

305. Epilobium tetragonum Linn.
Chakung Chu, 11—12,000 ft., No. 3978.

306. Epilobium amplectens Hassk ?
Changu, Chamnago, 11—12,000 ft., Nos. 3117, 3869.

115. Circæa Linn.

307. Circæa lutetiana Linn.
Phadonchen, 8—10,000 ft.

308. Circæa alpina Linn.
Changu, Chakung Chu, 11—12,000 ft., No 3579.

XXXVII.—CUCURBITACEÆ

116. Trichosanthes Linn.

309. Trichosanthes Wallichiana Wight
Phadonchen, 7,000 ft., No. 4461.

117. Herpetospermum Wall.

310. Herpetospermum caudigerum Wall.
Common at 7—8,000 ft., No. 4777 *Ribu* !

118. Warea Clarke.

311. Warea tonglensis C. B. Clarke
Phadonchen, 7—10,000 ft., No. 4432. Frequent.

119. Edgaria Clarke.

312. Edgaria darjeelingensis C. B. Clarke
Phadonchen, 7—8,000 ft., No. 4418. Common.

XXXVIII.—BEGONIACEÆ.

120. Begonia Linn.

813. Begonia Josephi A. DC.
Phadonchen, 6—8,000 ft.

814. Begonia laciniata Roxb.
Song, Samatek, lower Dikchu Valley, 6—7,000 ft., No. 3355.
VAR **flava.**
Namchi, 5,000 ft., No. 2907.

815. Begonia megaptera A. DC.
Gangtok, Karponang, 7—8,000 ft.

XXXIX.—UMBELLIFERÆ.

121. Hydrocotyle Linn.

816. Hydrocotyle javanica Thunb.
Phadonchen, Ari, 3—8,000 ft.

122. Sanicula Linn.

817. Sanicula europæa Linn.
Common, 7—11,000 ft.

123. Vicatia DC

818. Vicatia millefolia C. B. Clarke
Changu, Ningbil, 11—14,000 ft., Nos. 4106, 4114, 4286.

124. Trachydium Lindl.

819. Trachydium novemjugum C. B. Clarke
Kapoop, 12,000 ft., No. 3112.

820. Trachydium affine W. W. Smith. sp. nov.

Species *Trachydio novemjugo* Clarke proxima sed diverso habitu gracilior, evolutior, foliorum segmentis angustioribus nec orbicularibus.

Herba perennis radice longa fusiforme. *Caulis* ad 25 cm. longus, gracilis, striatus, glaber. *Folia* subradicalia, 2—3, ad 10 cm. longa pinnata ; vagina magna, alba, membranacea ; petiolus 2—2-plo laminam excedens ; pinnae 5—7, ellipticae vel cuneato-obovatae, 1 cm. longae, 5 mm. latae, apice serratae, vel 5—6-fidae. *Umbellae* 2—3, inferiores in singulis bracteis foliaceis axillantes, superior terminalis 2—3 bracties, ad 2—3 cm. longis, in segmenta linearia 3—7-fidis, instructa, radis 4—6, gracilibus, 2—3 cm. longis ; umbellulorum radii 8—10, bracteolis 2—3 quam bracteis minoribus sed subsimilibus. *Petala* orbicularia, lurido-viridia. *Discus* conspicuus, 6—8-lobus. *Fructus* immaturus, ovoideus, subquadratus, sub calycis margine constrictus, carpellis 9-jugatis. Sikkim Himalaya :—Ningbil, Chola range, at an elevation of 13,500—14,000 ft., Nos. 4109, 4115.

A species closely allied to *Trachydium novemjugum* with similar fruits at the early stage, and with the same lurid green petals. *Trachydium novemjugum* comes from the drier, more exposed hills of north Sikkim ; the moister conditions of the Chola range may be sufficient to account for the marked difference in habit, which brings the species near in appearance to *Trachydium obtusiusculum.*

321. **Trachydium obtusiusculum** C. B. Clarke
Changu, Chola, Ningbil 11—14,500 ft., Nos. 4018, 4288.
VAR. **stricta**.
Chola, Dzalep, 13,500 ft. No. 4333.

125. Bupleurum Linn.

322. **Bupleurum Candollii** Wall.
Common, 10—13,000 ft., throughout the area.

323. **Bupleurum longicaule** Wall.
VAR. Changu, Laghep, 10—12,000 ft., Nos. 3309, 3365. Very common.

324. **Bupleurum falcatum** Linn.
VAR. **gracillimum** (Klotzsch) Wolff.
Laghep, Fieunggong, 10—11,000 ft., No. 3073.

126. Pimpinella Linn.

325. **Pimpinella Hookeri** C. B. Clarke
Chola, 11—12,000 ft., No. 3708.

326. **Pimpinella tenera** Benth.
Common, 10—14,000 ft., Nos. 3172, 3361.
VAR. ? Nos. 4287, 4487, 4553.

327. **Pimpinella acronemaefolia** C. B. Clarke
Nathui La, Changu, 13,000 ft., Nos. 4270, 4524.

328. **Pimpinella diversifolia** DC.
Common, 8—10,000 ft., No. 4416.

329. **Pimpinella trifoliata** Wall.
Chola, 12,000 ft., No. 3613.

127. Oenan Linn.

330. Oenanthe Thomsoni C. B. Clarke
Phadonchen, Karponang, 6—8,000 ft.

128. Selinum Linn.

331. Selinum tenuifolium Wall.
Changu, Chola, Gnatong, 10—13,000 ft. Common.

332. Selinum Condollii DC.
Chakung Chu, Chamnago, 12—13,000 ft., No. 3815.

129. Cortia DC.

333. Cortia Lindleii DC.
Common throughout the Chola Range, 12—15,000 ft.

334. Cortia Hookeri C. B. Clarke
Changu, Tosa, 13—16,000 ft., more sparingly than in northern Sikkim.

130. Pleurospermum Hoffm.

335. Pleurospermum sikkimense C. B. Clarke
Changu, Tosa, Ningbil, Gnatong, 12—14,000 ft.

336. Pleurospermum Benthami C. B. Clarke?
Changu, Chola, 11—13,000 ft., Nos. 3586, 3728, 4024. Closely allied if not equivalent to the Nepal plant of Wallich.

337. Pleurospermum dentatum Benth.
Dikchu, Ningbil, 11—13,500 ft., Nos. 3765, 4129.
VAR. **erosa**
Dzalep, 12—13,000 ft., No. 4330. Doubtfully distinct.

338. Pleurospermum apiolens C. B. Clarke
Nathui La, Chamnago, 12—14,000 ft., Nos. 4415, 4572, *Ribu*!

339. Pleurospermum Hookeri C. B. Clarke
Gnatong, 11—12,000 ft.

131. Archangelica Hoffm.

340. Archangelica officinalis Hoff.
Laghep, Chola, 10—12,000 ft.

132. Heracleum Linn.

341. Heracleum Wallichii DC.
Lachung Valley, W. of Tanka La, 9,000 ft., No. 4741 *Ribu*!

342. **Heracleum nubigenum** C. B. Clarke
Chola, Yakla, 10—14,000 ft.

343. **Heracleum sublineare** C. B. Clarke
Common throughout the Chola range, 11—13,500 ft., No. 4358.

344. **Heracleum nepalense** Don
Common, 10—13,000 ft., No. 3816.

XL.—ARALIACEÆ.

133. Aralia Linn.

345. **Aralia Pseudo-ginseng** Benth.
Common, 7—11,000 ft.

346. **Aralia bipinnatifida** C. B. Clarke
Laghep, 10,000 ft., No. 3375.

347. **Aralia cissifolia** Griff.
Common, 10—12,000 ft.

348. **Aralia cachemirica** Dcne.
Phadonchen, Ningbil, 7—11,000 ft. Common.

349. **Aralia armata** Seem.
Karponang, 7—8,000 ft., 4655 *Ribu* !

134. Pentapanax Seem.

350. **Pentapanax Leschenaultii** Seem.
Common, 9—10,000 ft.

135. Helwingia Willd.

351. **Helwingia himalaica** Hook. f. & T
Phadonchen, 8—9,000 ft.

136. Heptapleurum Gaertn.

352. **Heptapleurum impressum** C. B. Clarke
Phadonchen, 8—10,000 ft., No. 4487.

353. **Heptapleurum venulosum** Seem.
Ari, Rhenock, 3—5,000 ft.

137. Trevesia Vis.

354. **Trevesia palmata** Vis.
Ari, 3—5,000 ft.

138. **Brassaiopsis** Dcne. & Planch.

855. **Brassaiopsis alpina** C. B. Clarke
Karponang, Phadonchen, 8—10,000 ft., Nos. 3005, 4410.

139. **Macropanax** Miq.

856. **Macropanax oreophilum** Miq.
Phadonchen 5—7,000 ft.

140. **Hedera** Linn.

857. **Hedera Helix** Linn.
W. of Tanka La, 9—10,000 ft.

141. **Gamblea** C. B. Clarke.

858. **Gamblea ciliata** C. B. Clarke
Fieunggong, 10,000 ft. *Gammie*!

XLI.—CORNACEÆ.

142. **Alangium** Lamk.

859. **Alangium begoniifolium** (Roxb.) Baill.
Rhenock, Ari, 3—5,000 ft., No. 4493.
? VAR. **alpina.**

Phadonchen, 5—9,000 ft., No. 4494.

It has long been known that there are two "Marleas" in the Sikkim Himalaya. Among the specimens collected by Sir Joseph Hooker there is one marked "2 Marlea alt. 6—9,000 ft." This is the one referred to by C. B. Clarke in the "Flora of British India," Vol. II, p. 744, as VAR. *alpina*. It is distinguished from the type by the leaves not angular, hairy all over beneath and no tufts in the nerve-axils. Later Sir George King separated similar plants in fruit as *Marlea sikkimensis* King Mss. In Kew Herbarium meanwhile to judge from Brandis, "Indian Trees" p. 355, the same plant appears as *Marlea alpina* Gamble Mss. and as such is accorded in that volume a brief diagnosis.

The tree is recognised by the Lepcha aborigines of Sikkim as distinct and receives in their language a different name. The low level form 1—6,000 ft. is Palit-kung while the high level from 5—9,000 ft. is Palit-nyok.

Wangerin in '*Das Pflanzenreich*,' iv, 220 b., p. 20, makes no reference to this species or variety, and to judge from the measurements given of the fruit of the widespread *A. begoniifolium* did not see an authentic specimen of the high Sikkim plant. The fruit of this plant measures 18—20 mm. long, and 8—9 mm. broad, measurements which exceed the limits given to *A. begoniifolium*. Further observations in the field are wanted.

XLII.—CAPRIFOLIACEÆ.

143. Sambucus Linn.

360. Sambucus javanica Bl.
Gangtok, Karponang, Phadonchen, 5—8,000 ft.

361. Sambucus adnata Wall.
Chakung Chu, W. of Tanka La, 9—10,000 ft.

144. Viburnum Linn.

362. Viburnum stellulatum Wall.
Phadonchen 9,000 ft.

363. Viburnum cordifolium Wall.
Very common, Laghep, Changu, 10—12,000 ft.

364. Viburnum erubescens Wall.
Very common, 7—10,000 ft.

145. Triosteum Linn.

365. Triosteum hirsutum Wall.
Changu, 10—11,000 ft.

146. Lonicera Linn.

366. Lonicera macrantha DC.
Song, Karponang, 4—8,000 ft., No. 2934.

367. Lonicera hispida Pall.
Changu, Chamnago, 10—12,000 ft., No. 3209.

368. Lonicera angustifolia Wall.
Dikchu Valley, 11—12,000 ft., No. 3744.

147. Leycesteria Wall

369. Leycesteria glaucophylla Hook. f.
Karponang, 8,000 ft., No. 4676 *Ribu*!

370. Leycesteria Belliana W. W. Smith (Trans. Bot. Soc. Edin. xxiv 173).
Karponang, 9—10,000 ft., No. 2996.
A new species closely allied to *Leycesteria sinensis* Hems

XLIII.—RUBIACEÆ.

148. Hymenopogon Wall.

371. **Hymenopogon parasiticus** Wall.
Phadonchen, 7—8,000 ft.

149. Hedyotis Linn.

372. **Hedyotis stipulata** Br.
Karponang, Phadonchen, 7—8,000 ft., No. 4398.

150. Ophiorrhiza Linn.

373. **Ophiorrhiza Harrisiana** Heyne VAR. **rugosa**
Karponang, 7—8,000 ft., Nos. 3040, 3248.

374. **Ophiorrhiza Treutleri** Hook. f.
Gangtok, Karponang, 6—7,000 ft., No. 2951.

375. **Ophiorrhiza fasciculata** Don
Temi, Lower Dikchu Valley, 6—7,000 ft., No. 2923

151. Rubia Linn

376. **Rubia cordifolia** Linn.
Karponang, Laghep, 8—9,000 ft.

152. Galium Linn.

377. **Galium rotundifolium** Linn.
Common, at Karponang, 8—9,000 ft.

378. **Galium triflorum** Michx.
Changu, Dikchu, 9—12,000 ft. Common.

379. **Galium asperifolium** Wall.
Common, 9—12,000 ft.

380. **Galium acutum** Edgew.
Common throughout the Chola range, 9—13,000 ft.

XLIV.—VALERIANEÆ

153. Nardostachys DC.

381. **Nardostachys Jatamansi** DC.
Changu, Chola, 12—16,000 ft. Common.

154. **Valeriana** Linn.

382. **Valeriana Hardwickii** Wall.
Very common at Changu, 11—14,000 ft.

XLV.—DIPSACEÆ.

155. **Triplostegia** Wall.

383. **Triplostegia glandulifera** Wall.
Laghep, Changu, Gnatong, 9—12,000 ft. Frequent.

156. **Morina** Linn.

384. **Morina polyphylla** Wall.
Ningbil, 13—14,000 ft., Nos. 4107, 4168.

385. **Morina betonicoides** Benth.
Changu, Chola, 12—13,000 ft. Common.

157. **Dipsacus** Linn.

386. **Dipsacus inermis** Wall.
Changu, 11—12,000 ft. Common.

XLVI.—COMPOSITÆ.

158. **Myriactis** Less.

387. **Myriactis Wallichii** Less.
Gnatong, 11—12,000 ft., No. 4370.

159. **Aster** Linn.

388. **Aster himalaicus** C. B. Clarke
Tosa, 13—14,000 ft., No. 4064.

389. **Aster tricephalus** C. B. Clarke
Kapoop, Lachung, 10—13,000 ft., No. 3334.

390. **Aster Stracheyi** Hook. f.
Ningbil, 12—13,000 ft., Nos. 4158, 4159.

391. **Aster Heterochæta** Benth.
Dikchu, 12,000 ft., No. 3766.

160. **Brachyactis** Led.

392. **Brachyactis menthodora** Benth.
Gipmochu, Sherabthang, 13—14,000 ft., Nos. 4348, 4584.

161. Erigeron Linn.

393. **Erigeron multiradiatus** Benth.
Changu, Chola, Gnatong, 11—13,000 ft., No. 4267. Not common.

162. Microglossa DC.

394. **Microglossa albescens** C. B. Clarke
West of Tanka La, 12—13,000 ft.

163. Leontopodium Br.

395. **Leontopodium alpinum** Cass.
Gnatong, Gipmochu, Gaoring, 13—15,000 ft., No. 4346.

164. Anaphalis DC.

396. **Anaphalis nubigena** DC.
Changu, Tosa, 13—15,000 ft. common.

397. **Anaphalis cuneifolia** Hook. f.
Chakung Chu, Chola, 11—13,000 ft., Nos. 3963, 4137.

398. **Anaphalis Royleana** D. C. var. **cana.**
West of Tanka La, 13,000 ft., No. 4714 *Ribu* !

399. **Anaphalis triplinervis** C. B. Clarke
Laghep, 10,000 ft.

400. **Anaphalis subumbellata** C. B. Clarke
Chamnago, Gnatong, 12—13,000 ft., Nos. 3638, 4340, 4357.

401. **Anaphalis araneosa** DC.
Namchi, W. of Tanka La, 6—9,000 ft., No. 2904.

402. **Anaphalis contorta** Hook. f.
Changu, W. of Tanka La, 11—13,000 ft., No. 4717 *Ribu* !

165. Inula Linn.

403. **Inula Hookeri** C. B. Clarke
W. of Tanka La, 9—10,000 ft.

166. Carpesium Linn.

404. **Carpesium cernuum** Linn.
Fieunggong, Laghep, 8—10,000 ft.
var. **pedunculosa**
Phadonchen 8,000 ft., No. 4389.

167. **Adenocaulon** Hook.

405. Adenocaulon bicolor Hook.
Laghep, 9—10,000 ft.

168. **Chrysanthemum** Linn.

406. Chrysanthemum Atkinsoni C. B. Clarke
Changu, Gnatong, 11—14,000 ft., No. 3604 Very common.

169. **Artemisia** Linn.

407. Artemisia parviflora Roxb.
Lower Chakung Chu, 9—10,000 ft.

408. Artemisia vulgaris Linn.
Karponang, Phadonchen, 6—7,000 ft.

409. Artemisia Campbellii H. f. & T.
Changu, Chola, 13,000 ft., No. 3571.

170. **Cremanthodium** Benth.

410. Cremanthodium reniforme Benth.
Gnatong, 12—13,500 ft., Nos. 4321, 4364. Rare in this area.

411. Cremanthodium Decaisnei C. B. Clarke
Tosa, 14—15,000 ft. Uncommon.

412. Cremanthodium Thomsoni C. B. Clarke
Very common, 12—14,000 ft., over the Chola range.

413. Cremanthodium pinnatifidum Benth.
Gnatong, W. of Tanka La, 13—14,000 ft., No. 4614 *Ribu* ! Sparingly.

171. **Doronicum** Linn.

414. Doronicum sp. aff. **Roylei** DC.
Chola, Gaoring, 12—13,500 ft., Nos. 3607, 4013, 4502 *Ribu*

Not quite the West Himalayan plant. A tall plant, 3—4 ft. high; capitula less glandular than those of *D. Roylei*, achenes sparsely ciliate, pappus white. Occurs also in the Chumbi Valley and has been referred to both *D. Roylei* and *D. altaicum* Pall. It does not agree quite with either.

415. Doronicum Hookeri C. B. Clarke
Tanka La, 12,000 ft. *King's collector* !

172. Gynura Cass.

416. Gynura nepalensis DC.
Phadonchen, 7,000 ft.

173. Senecio Linn.

417. Senecio graciliflorus DC.
Frequent from 9—12,000 ft.

418. Senecio biligulatus W. W. Smith. (Journ. Asiat. Soc. Beng., new series, vii, 69.)

Changu, Kapoop, Gnatong, 12—13,000 ft., Nos. 4223, 4245, 4277, 4325. Also collected by Scully in Nepal.

A new species allied to *Senecio graciliflorus*.

419. Senecio chrysanthemoides DC.
Common near Changu, 10—12,000 ft.

420. Senecio Yakla C. B. Clarke
Sherabthang, Kapoop, Gaoring, Yakla, Chola, 13—15,000 ft., Nos. 3393, 3439, 3697, 4000, 4370.

The Senecios of the section *Ligularia* are very difficult of discrimination in the herbarium and are troublesome enough in the field. Both racemose and corymbose types are common on the Chola range and I had the opportunity of comparing the species in a fresh condition. Of the corymbose types the Flora of British India gives two species for the East Himalaya—*S. Yakla* reduced to *S. amplexicaulis* and *S. pachycarpus*. I have had to add a new and very distinct species *S. Kingianus*. True *S. amplexicaulis* I have not seen in the East Himalayas and in my opinion *S. Yakla* should be restored. None of the other allied species have its numerous short broad ligules. Clarke named his species after the pass known as Yak La. This pass I visited and Clarke's plant is there at an elevation of 13—15,000 ft. It affects marshy ground, even tussocks in the streams and is usually one to two feet high. There is no *Senecio* of three feet high at 16,000 ft. in the Chola range, the altitude given in the "Flora of British India" though Clarke himself gives 12—15,000 ft. in "Compositæ Indicæ." The plant is nearly glabrous, with 1—2 radical leaves, orbicular or reniform, 8—9 inches in diameter; petiole not winged. Capitula comparatively few, 8—14, short and broad, drooping, many-flowered; involucral bracts 16—18 acute or obtuse, half an inch long, connate below, slightly pubescent; ligules 15—18, scarcely exceeding the involucral bracts, broad, obovate or elliptic, not linear oblong, more or less involute, pappus white, longer than the achene. However in its less developed form this species approaches *S. retusus* from which it is distinguished by its corymbose inflorescence and short blunt ligules. I find Wallich's original specimen of *S. retusus* has long narrow ligules and the plant is thus described by Clarke, though in the "Flora of British India" Hooker says "short, broad." In small specimens the corymbose inflorescence, not a very good chararacter at any time, is a negligible distinction and one is left with the character of the ligules and a difference in habit difficult to appreciate except in the field and possibly due to very wet habitat. If we refer all the short liguled forms to *S. Yakla* even when depauperated with racemose inflorescence, we bring *S. retusus* and *S. calthæfolius* very near together, distinguishable chiefly by the very slender habit of the latter and the narrow capitula with reddish pappus. Specimens of *S. Yakla* named by Clarke himself are in the Calcutta Herbarium and these agree with his description except as regards size; we have nothing approaching a plant 3 feet high. However in the field all these Senecios in their typical forms are appreciably distinct and I do not propose at present the reduction of any of them. *Senecio pachycarpus* Clarke occurs in the same area, affects the drier slopes, is later in flowering, and is distinguished by the many-flowered capitula with 10—12 involucral bracts, and 7—8 very long ligules. It comes nearest to the western *S. amplexicaulis,* and may ultimately be esteemed only a variety.

S. Kingianus is I believe a very local plant. I did not see it at Laghe nor in the Dikhchu Valley, and it was by that route that the Chola and Yakla were visited by Hooker and Clarke. It is a fine tall plant about 3 ft. high and just above and below Changu occurs in great abundance along with *Senecio Mortoni.* As this particular corner was not opened up until the road in connection with the Tibet expedition of 1903 was made through it is practically certain that the plant was not obtained by Clarke. Its inflorescence recalls that of *S. Mortoni,* but the leaves are quite different. Its narrow few-flowered capitula with three ligules distinguish it easily from the other species.

421. Senecio pachycarpus C. B. Clarke

Changu, Kapoop, Gnatong, 12—14,000 ft., Nos. 3220, 3438 4201, 4365. Common.

422. Senecio Kingianus W. W. Smith. (Journ. As. Soc. Beng., new series, vii, 71.)

Changu, Gnatong, 11—13,000 ft., Nos. 3131, 3401, 4292, 4556, *Ribu* !

423. Senecio Mortoni C. B. Clarke

Common at Changu, 11—13,000 ft.

424. Senecio Ligularia Hook f. *S. cacaliæfolius* Schultz-Bip.

Changu, Chola, 11-12,000 ft., No. 4261.

VAR. **Ansonikt** ?

Changu, Yakla, Kapoop, 11—12,000 ft., Nos. 3205, 3431.

This slender plant is common near Yakla, but has long narrow ligules, and is therefore not identical with Clarke's plant which has very short ligules. Perhaps both are only slender forms of the variable *S. Ligularia.* The racemose types of the section are even more confused than the corymbose and I am unable to distinguish them clearly even after observation in the field. Clarke records *S. Atkinsoni* from Yakla.

425. Senecio retusus Wall.

Changu, Chola, 12—13,000 ft., Nos. 3621, 4250, 4260.

426. Senecio calthæfolius Hook. f. non Maxim. *S. nimborum* Franch.

Changu, Chola, Ningbil, 12—13,000 ft., Nos. 3750, 4204.

I found it difficult to distinguish in the field from slender forms of *S. retusus.*

427. Senecio Lagotis W. W. Smith. (Journ. As. Soc. Beng. new series, vii, 70.)

Changu, Kapoop, Dickchu, 12—13,000 ft., Nos. 3414, 3516, 3748.

A new and very distinct species with leaves recalling those of *Bupleurum Candollii.*

428. Senecio Wallichii DC.

Sherabthang, 12,000 ft., No. 4604 *Ribu* !

429. Senecio alatus Wall.

Very common, 7—13,000 ft.

430. Senecio Candolleanus Wall.

Changu, Ningbil, 12—13,000 ft., Nos. 4132, 4258.

431. Senecio quinquelobus H. f. & T.

Chola, Yakla, Gnatong, 12—13,000 ft., No. 4359. Common.

432. Senecio Chola W. W. Smith. (Journ. As. Soc. Beng., new series, vii, 72).

Chakung Chu, 12—13,000 ft., Nos. 4134, 4501 *Ribu* ! 4680 *Ribu* !

A new species allied to *S. quinquelobus.*

433. Senecio acuminatus Wall.

W. of Tanka La, 10—11,000 ft.

174. Cnicus Linn.

434. Cnicus involucratus DC.

Changu, Chola, 11—12,000 ft.

435. Cnicus eriophoroides Hook. f.

Dikchu, 11—12,000 ft., No. 3764.

175. Saussurea DC.

436. Saussurea obvallata Wall.

Changu, Chola, 11—15,000 ft. Not common.

437. Saussurea uniflora Wall.

Changu, Chamnago, Gipmochu, 11—14,000 ft.

438. Saussurea Sughoo C. B. Clarke

Changu, Chamnago, 11—13,000 ft., No. 3797, 4279.

439. Saussurea Yakla C. B. Clarke

Recorded from Chola and Yakla. I saw nothing I could discriminate from *S. Sughoo.*

440. Saussurea taraxicifolia Wall.
Dzalep, 13—14,000 ft., No. 4336.
VAR. **depressa**
Chola, Chakung Chu, 12—14,000 ft., Nos. 3649, 3848, 4029, 4155.

441. Saussurea Kunthiana C. B. Clarke
Changu, Gnatong, 11—12,000 ft., Nos. 4242, 4613.
VAR. **filicifolia**
Changu, Yakla, 12—13,000 ft., No. 4254.

442. Saussurea nimborum W. W. Smith (Journ. As. Soc. Beng., new series, vii, 73). Dzalep, 14—15,000 ft., *King's collector* !

443. Saussurea hypoleuca Spreng.
Changu, Gnatong, 12—13,000 ft., No. 4371.

444. Sausserea deltoidea C. B. Clarke.
Karponang, Laghep, 9—10,000 ft.

445. Saussurea denticulata Wall.
Dikchu, 10—11,000 ft.

446. Sausserea Laueana W. W. Smith (Journ. As. Soc. Beng., new series, vii, 74).
Changu, Chola, Ningbil, Kapoop, 11—14,000 ft., Nos. 3920, 4130, 4263, 4549 *Ribu* !

A new species allied to *S. Lappa*.

447. Saussurea gossypiphora Don
Sparingly at 13—14,000 ft. throughout the Chola range.

176. Ainsliæa DC.

448. Ainsliæa pteropoda DC.
Karponang, 7—9,000 ft. Common.

449. Ainsliæa aptera DC.
Karponang, 8—10,000 ft.

177. Crepis Linn.

450. Crepis depressa H. f. & T.
Changu, Gnatong, 12—13,000 ft.

451. Crepis glomerata Dcne.
Sparingly over the range at 14—15,000 ft.

178. Taraxacum Hall.

452. Taraxacum officinale Wigg.
Changu, Chamnago, 11—12,000 ft.
VAR. **eriopoda**
Chamnago, 12—13,000 ft., Nos. 3702, 4301.

179. Lactuca Linn.

453. Lactuca hastata DC.
Chakung Chu, W. of Tanka La, 8—10,000 ft.

454. Lactuca macrantha C. B. Clarke
Very common, 11—13,000 ft.

455. Lactuca Dubyæa C. B. Clarke
Common, 11—13,000 ft.

XLVII.—CAMPANULACEÆ.

180. Lobelia Linn.

456. Lobelia erecta H. f. & T.
Very common, 8—12,000 ft., over the Chola range.

457. Lobelia pyramidalis Wall.
Phadonchen, 7—8,000 ft.

181. Codonopsis Wall.

458. Codonopsis Benthami H. f. & T.
Dzalep, Yakla, 9—11,000 ft.

459. Codonopsis subsimplex H. f. & T.
Very common, 11—13,000 ft., Nos. 4250, 4298.

460. Codonopsis fœtens H. f. & T.

Changu, Chola, Gnatong, 12—15,000 ft., No. 3811. Common. The corolla is globose campanulate, not constricted, sky-blue without upper half within sky-blue, lower half lurid purple.

461. Codonopsis dicentrifolia (Clarke) W. W. Smith, Comb. nov.

Species *Codonopsidis thalictrifoliæ* et *C. ovatæ* affinis sed inter alia foliis omnino glabris distinguenda.

Planta sub-erecta elegans. *Radix* lignosa, robusta, 5—15 mm. diametiens. *Caulis* erectus, teres, glaber, flexilis, gracilis, 30—40 cm. altus, ramulis multis fere recto angulo patentibus. *Folia* radicalia nulla; caulina parva, 1—3·5 cm. longa, ·5—1·8 cm. lata, petiolo 5 mm. longo gracile, alterna vel opposita in eodem specimine, ovata, obtusa, rarius sub-obtusa, basi rotundata vel sub-cuneata, glabra, nervis obscuris 2—3-paribus. *Flores* solitarii terminales, 2—5 cm. pedunculati, nutantes. *Calyx* 5-partitus; lobi 1 cm. longi, 1 mm. lati, distantes, lineares, sub-obtusi, virides, in fructu persistentes. *Corolla* supra campanulata, ad 3 cm. longa, ad 3 cm. lata, ad tertiam partem fissa, cœrulea, sublurida, lobis ovatis vel late-triangularibus. *Stamina* brevia, curva, filamentis lato cardine linearibus, glabra. *Ovarium* 1·5 cm. longum, 1 cm. latum, inferum, obconicum, 10-costatum, in fructu ad 5 mm. rostratum, loculicide 3-loculare. *Semina* 1·5 mm. longa, ellipsoidea, nitentia.

Wahlenbergia ? *dicentrifolia* C. B. Clarke in Flora Brit. Ind., iii, 430; *Codonopsis Margaritæ* W. W. Smith in letteris et in duplicatis et seminibus distributis.

Phallut, 11,000 ft. ; *Clarke* ! Gnatong Chu, South East Sikkim at an elevation of 11,000 ft., No. 4381 *Smith* ! Sandakphu, No. 371 *Ribu* !

A very graceful plant growing on the face of wet precipices in a deep valley. It recalls *Codonopsis fœtens* and *C. thalictrifolia*, but is free from the objectionable odour of those species. The slender branches bear the small ovate leaves so regularly as to give the impression of a long pinnate leaf. As in its nearest allies, there are no radical leaves and usually 3—6 inches of whitish stem appear underground before we come to the thick rootstock. The plants bears from one to twelve flowers. The corolla is bluish, with a dappling of light and dark blues. The ovary is surmounted by a black shining disc and at the edge of this disc the stamens are inserted. The stigma is at first clubshaped, later shortly trilobed. The plant is protandrous, the stamens withering before the stigmata diverge.

The Calcutta Herbarium possesses no type of Clarke's plant and so the above description was written as for a new *Codonopsis*. Clarke's original diagnosis was based on fruiting specimens only. In my opinion clearly a *Codonopsis*.

182. **Cyananthus** Wall.

462. Cyananthus lobatus Wall.
Changu, Dzalep, Gipmochi, 12—13,000 ft., No. 4248. Common.

463. Cyananthus pedunculatus C. B. Clarke
Nathui La, Chamnago, 12—14,000 ft. Frequent.

464. Cyananthus incanus H. f. & T.
Gnatong, 11—12,000 ft.

183. **Campanumæa** Bl.

465. Campanumæa inflata C. B. Clarke
Phadonchen, 7—8,000 ft., No. 4453. Common.

184. **Peracarpa** H f. & T

466. Peracarpa carnosa H. f. & T.
Karponang, 7—9,000 ft., No. 2974. Common

185. **Campanula** Linn.

467. **Campanula colorata** Wall.
Karponang, Phadonchen, 6—8,000 ft.

468. **Campanula argyrotricha** Wall.
Nathui La, Tanka La, 13—14,000 ft., No. 4583 *Ribu*!

XLVIII.—VACCINIACEÆ.

186. **Pentapterygium** Klotsch

469. **Pentapterygium serpens** Klotsch
Phadonchen, Karponang, 7—8,000 ft.

187. **Vaccinium** Linn.

470. **Vaccinium nummularia** H. f. & T.
Karponang, Chakung Chu, 8—11,000 ft.

471. **Vaccinium retusum** Hook. f.
Phadonchen, 8—9,500 ft. No. 4411.

472. **Vaccinium serratum** Wight
Phadonchen, 6—8,000 ft.

473. **Vaccinium Dunalianum** Wight
Phadonchen, 7—8,000 ft., No. 4449.

XLIX.—ERICACEÆ.

188. **Gaultheria** Linn.

474. **Gaultheria nummularioides** Don
Common, 8—9,000 ft.

475. **Gaultheria trichophylla** Royle

The typical form is common from 10—14,000 ft., throughout the Chola range. What I take to be a variety with nearly glabrous leaves and a fruit nearly half an inch in diameter is found at Karponang, 8—9,000 ft., No. 2983.

476. **Gaultheria pyrolæfolia** Hook. f.
Ningbil, 13—14,000 ft., No. 4119. Sparingly.

477. **Gaultheria fragrantissima** Wall.
Karponang, 8—9,000 ft. Common.

478. **Gaultheria Griffithiana** Wight.
Phadonchen, 9—10,000 ft., No. 4417

189. Cassiope D. Don

479. Cassiope fastigiata D. Don
Very common, 11—13,000 ft., Nos. 3261, 3430.

480. Cassiope selaginoides H. f. & T.
Also common, 12—14,000 ft., Nos. 3301, 3490.

190. Pieris D. Don

481. Pieris ovalifolia D. Don
Common, 4—11,000 ft.

482. Pieris villosa Hook. f.
Laghep, Dikchu, 9—11,000 ft.

483. Pieris formosa D. Don
Ningbil, 10,000 ft.

191. Enkianthus Lour.

484. Enkianthus himalaicus H. f. & T.
Phadonchen, Changu, 9—11,000 ft., No. 3320.

192. Diplarche H. f. & T.

485. Diplarche pauciflora H. f. & T.
Tanka La, 15,000 ft., *Gammie* !

193. Rhododendron Linn.

I do not propose to give a detailed list. The species of the Chola were collected in November 1849 in the vicinity of Laghep by Sir Joseph Hooker who enumerates 24 of them in Him. Journ., ii, 197. Further north near Fieunggong Mr. G. A. Gammie found all the Sikkim species with the exception of *Rhododendron nivale*. It is as the latter points out—Gazetteer of Sikkim, 1894, p. 107—a remarkable specific concentration of the genus. As I was too late for the flowers of the majority and much too early for seed, I did not devote any time to the genus though most of the species were collected incidentally.

L.—MONOTROPEÆ.

194. Monotropa Linn.

486. Monotropa uniflora Linn.
Dikchu Valley, 7—8,000 ft., No. 3820.

LI.—DIAPENSIAEÆ.

195. Diapensia Linn.

487. Diapensia himalaica H. f. & T.

Nathui La, Chola, Ficunggong, 11—14,000 ft., Nos. 3442, 3570, 3892.

LII.—PRIMULACEÆ.

196. Primula Linn.

488. Primula Gambeliana Watt

Tosa, 13,000 ft., No. 3924. In the crevices of wet rocks. **Rare.**

489. Primula pulchra Watt

Chamnago, 11—12,000 ft. *King's collector* !

490. Primula reticulata Wall.

Common in the Chola range, 11—18,000 ft., Nos. 3041, 3591, 3582, 3583.

491. Primula vaginata Watt

Laghep, 10,000 ft., Nos. 3292, 4537 *Ribu* ! Apparently a very local plant.

492. Primula geraniifolia Hook. f.

Karponang, Chola Valley, 9—12,000 ft., Nos. 3042, 3721, 4547, 4358 *Ribu* !

493. Primula capitata Hook.

Common on the Chola range, 12—14,000 ft., Nos. 3429, 3621, 4010, 4171.

494. Primula erosa Wall.

Ningbil, 13,000 ft., No. 4209.

495. Primula glabra Klatt

Kapoop, Ningbil, 13—14,500 ft., Nos. 3405, 4076.

496. Primula involucrata Wall.

Changu, Kapoop, Chamnago, 12—13,000 ft., Nos. 3395, 3406, 3773.

497. Primula obtusifolia Royle

Common at Changu, Kapoop, and Chola, 12—14,000 ft., Nos. 3086, 3285, 3509, 3590.

498. Primula elongata Watt

Changu, Sherabthong, 12—14,000 ft., Nos. 3092, 3259, 3444, 3600.

This species is closely allied to *Primula Stuartii.* Its capsule distinguishes it from *P. obtusifolia* as well as its colour.

499. **Primula Stuartii** Wall. forma, forsan sp. distincta.

Very common on the Chola range, 11–14,000 ft., Nos. 3269, 3580, 3699, 3929, 4003.

500. **Primula nivalis** Pall. VAR. **macrocarpa**

Tosa, Ningbil, 14—15,000 ft., Nos. 3953, 4036. The flowers were white with a tinge of purple.

501. **Primula sikkimensis** Hook. f.

Very common, 11–12,000 ft.

502. **Primula Kingii** Watt

Changu, Sherabthang, 13,000 ft., Nos. 3394, 4294.

503. **Primula Elwesiana** King

Above Changu, 12—13,000 ft., No. 3127. Plentiful locally.

504. **Primula pusilla** Wall.

Changu, Chola, 13—15,000 ft., Nos. 3090, 3235, 3911.

505. **Primula sapphirina** Hook. f. & T.

Changu, Chola, 12—14,000 ft., Nos. 3088, 3234.

506. **Primula uniflora** Klatt

Tosa, Gaoring, Chakung Chu, 13—14,000 ft., Nos. 3847, 3942, 4007.

507. **Primula Wattii** King

W. of Changu, W. of Yakla, Chola, 12—13,000 ft., Nos. 3312, 3606, 4405 *Ribu* !

508. **Primula soldanelloides** Watt

Kapoop, Changu, Chola, 13–15,000 ft., Nos. 3091, 3420, 3690. Frequent.

509. **Primula petiolaris** Wall

Laghep, Changu, 9—12,000 ft. Common.

510. **Primula Tanneri** King

Laghep, 12,000 ft., No. 3290.

511. **Primula minutissima** Jacq. VAR. **spathulata**

Tosa, 14—15,000 ft., No. 4071.

512. **Primula muscoides** Hook. f.

Common at 14—15,000, over the Chola range, Nos. 3170, 3484, 3668, 3863, 3943.

513. **Primula tenuiloba** (Hook. f.) Pax

Chola, Tosa, Sherabthang, 14—15,000 ft., Nos. 3483, 3862, 3965.

197. **Androsace** Linn.

514. **Androsace geraniifolia** Watt
Lachung, W. of Tanka La, 9,000 ft., No. 3325.
515. **Androsace Hookeriana** Klatt
Tosa, Ningbil, 13—14,000 ft., No. 3960.
516. **Androsace Chamæjasme** Host. VAR. uniflora.
Changu, Ningbil, 13—15,000 ft., Nos. 3536, 4078, 4156.
517. **Androsace Poissonii** Knuth
Nathui La, 14—15,000 ft., No. 4570 *Ribu* '

198. **Bryocarpum** Hook. f. & T.

518. **Bryocarpum himalaicum** Hook. f. & T.
Laghep, Chakung, Chu, 9—12,000 ft., Nos. 3288, 3379, 3966.

199. **Lysimachia** Linn.

519. **Lysimachia ramosa** Wall.
Namchi, Karponang, 5—7,000 ft., No. 2903.

LIII.—MYRSINEÆ.

200. **Mæsa** Forsk.

520. **Mæsa rugosa** C. B. Clarke
Phadonchen, Karponang, 7,000 ft., No. 4444.
521. **Mæsa Chisia** Don
Phadonchen, 3—6,600 ft. Common.
522. **Mæsa indica** Wall.
Gantok, Phadonchen, 3—6,000 ft. Common.

LIV.—STYRACEÆ

201. **Symplocos** Linn.

523. **Symplocos ramosissima** Wall.
Phadonchen, 7—9,000 ft.
524. **Symplocos floribunda** Wall.
Phadonchen, 7,000 ft., No. 4468.
525. **Symplocos pyrifolia** Wall.
Temi, Phadonchen, 5—7,000 ft.

LV.—OLEACEÆ.

202. Jasminum Linn.

526. **Jasminum humile** Linn.
Lachung, W. of Tanka La, 9,000 ft., No. 3338.

LVI.—ASCLEPIADACÆ

203. Cynanchum Linn.

527. **Cynanchum Vincetoxicum** Pers.
Lachung, Chakung Chu, 8—9,000 ft., No. 3342.

204. Hoya Br.

528. **Hoya lanceolata**
Song, Gantok, 4—5,000 ft., No. 2933.

529. **Hoya longifolia** Wall.
Cheungtong, 5,000 ft., No. 3346.

LVII.—LOGANIACEÆ.

205. Buddleia Linn

530. **Buddleia Colvillei** Hook. f.
Karponang, Fieunggong, 9—12,000 ft., Nos. 2975, 3840. Occasional.

531. **Buddleia macrostachya** Benth.
Gantok, Karponang, 6—7,000 ft.

532. **Buddleia asiatica** Lour.
Rhenock, Ari, 3—6,000 ft. Common.

LVIII.—GENTIANACEÆ.

206. Gentiana Linn.

533. **Gentiana recurvata** C. B. Clarke
Fieunggong, 12,000 ft., No. 3874.

534. **Gentiana infelix** C. B. Clarke
Tosa, W. of Tanka La, 14—14,500 ft., Nos. 4057, 4183.

535. **Gentiana pedicellata** Wall.
Below Gnatong, 10,000 ft.

536. **Gentiana Prainii** Burkill

Changu, 12—13,000 ft., Nos. 3508, 3518, 4190, 4332, Common.

Corolla outside dark blue, inside white, marked below the middle with a varying number of blue and of yellow spots, usually about ten of each; corolla lobes curiously bifid, usually very irregularly so into two portions, the smaller segment usually very acute, larger subacute, filaments blue broadened downwards.

537. **Gentiana pluviarum** W. W. Smith (Journ. Asiat. Soc., Beng., new series, vii, 77, with fig.)

Changu, Chamnago, Fieunggong, 12—13,000 ft., Nos. 3527, 3662, 3907.

538. **Gentiana bryoides** Burkill

Changu, Chamnago, Gnatong 11—13,000 ft., Nos. 3082, 3115, 3818, 4318. Common.

539. **Gentiana sikkimensis** C. B. Clarke

Above Phadonchen, 12,000 ft., No. 4423.

540. **Gentiana Elwesii** C. B. Clarke

Common, 12—14,000 ft., Nos. 4266, 4295, 4316.

541. **Gentiana amœna** Wall.

Ningbil, 13,000 ft.

542. **Gentiana phyllocalyx** C. B. Clarke

Very common, 13—14,500 ft., Nos. 3569, 3948.

543. **Gentiana tubiflora** Wall.

Chola, 14,000 ft., No. 4451 *Ribu !*

544. **Gentiana ornata** Wall.

Laghep, Gnatong, 11—13,000 ft., Nos. 4403 *Ribu !* 4353.

VAR. **meiantha**

Fieunggong, 12,000 ft., No. 3906.

545. **Gentiana stylophora** C. B. Clarke

Changu, Chola, 11—14,000 ft., Nos. 3132, 3592, Common.

I add the following notes from my field book as the book description was based on imperfect material. Flowering stem 80—180 cm. high, glossy green, glabrous. Upper leaves strongly 7—9, nerved, sessile sometimes connate for 5 cm. at the base, large specimens 18 cm. by 9 cm. Calyx tube 1-2 cm., green shining, glabrous; lobes nearly 2-5 cm., triangular. Corolla up to 7·5 cm. long, and 7·5 cm. broad, widely funnel-shaped, 5-cleft to nearly the base; lobes 6 cm. by 4 cm., ovate-elliptic, apex rounded, greenish yellow outside, inside similar with many irregular pustular outgrowths, not fimbriate in the throat, indistinctly 7-9 veined moderately fleshy. Stamens up to 2·5 cm. long, attached a little below junction of tube and lobes; bases very stout, 4 mm. broad, giving firmness to corolla tube; filaments whitish tapering from 4 to 2 mm. broad, apex of filament broadened and pendent anther applied throughout to it; anther 1—1·1 cm. long, oblong, tapering from 4 to 2·5 mm.; ovary 2 cm., stigma 4 mm. long, deeply cleft, lobes nearly orbicular, 4 mm. broad, flattened out at maturity. The flower is protandrous. In the early stage the stigma is a rounded knob 2 mm. in diameter; the five anthers when ripe form a semicoherent mass round the style. Later the strong filaments begin to bend from the base and gradully the empty anthers are adpressed against the sides of the corolla lobes— a displacement of 2—3 cm.

207. **Pleurogyne** Eschsch.

546. **Pleurogyne sikkimensis** Burkill
Changu, 12,000 ft., No. 4631 *Ribu !*

208. **Swertia** Linn.

547. **Swertia dilatata** C. B. Clarke
Phadonchen, Changu, 7—11,000 ft., Nos. 4413, 4422.

548. **Swertia racemosa** Wall.
Gnatong, 11,000 ft., No. 4382.

549. **Swertia ramosa** W. W. Smith. (Journ. Asiat. Soc. Beng., new series, vii, 77 with fig.)
Karponang, 9,000 ft., Nos. 3032, 4539, *Ribu !* Rare.

550. **Swertia Hookeri** C. B. Clarke
Changu, Chola, Ningbil, 12—13,000 ft., No. 3186. Common.

551. **Swertia Kingii** Hook. f.
Chongu, Ningbil, Gipmochi, 13—13,500 ft. Nos. 4136, 4233.

Petals greenish-white with bluish base. This species is later in flowering than its allies in this area, as its flower-buds open about the middle of August.

552. **Swertia Burkilliana** W. W. Smith (Journ. Asiat. Soc., Beng., new series, vii, 78 with fig.)
Changu, Fieunggong, 12,000 ft., Nos. 3556, 3872, 4244, 4376 *Ribu* !

553. **Swertia cuneata** Wall.
Gnatong, 12—13,000 ft., No. 4343.

Sepals patent in bud, petals greenish without, bluish-white within, glands with long blue fimbriæ.

554. **Swertia multicaulis** Don
Common in the Chola range, 13—15,000 ft.

209. **Halenia** Borckh.

555. **Halenia elliptica** D. Don
Changu, Gnatong, 8—13,000 ft., Nos. 4281, 4345.

LIX. BORAGINEÆ.

210. **Ehretia** Linn.

556. **Ehretia Wallichiana** H. f. & T.
Song, Gangtok, 4—7,000 ft.

211. **Cynoglossum** Linn.

557. **Cynoglossum furcatum** Wall.
Karponang, Phadonchen, 7—9,000 ft.
558. **Cynoglossum micranthum** Desf.
Ari, Phadonchen, 5—7,000 ft., No. 4505.
559. **Cynoglossum denticulatum** A. DC.
Karponang, Laghep, 9—11,500 ft., Nos. 2993, 3795.

212. **Paracaryum** Boiss.

560. **Paracaryum glochidiatum** Benth.
Common, 10—13,000 ft.

213. **Eritrichium** Schrader.

561. **Eritrichium Munroi** C. B. Clarke
Nathui La, Chola, W. of Tanka La, 13—14,000 ft., No. 4185. Sparingly.
562. **Eritrichium tibeticum** C. B. Clarke
Changu, Chakung Chu, 11—12,000 ft., Nos. 3072, 3367, 3968.

214. **Trigonotis** Stev.

563. **Trigonotis microcarpa** Benth.
Lower Chakung Chu, 7—9,000 ft., No. 3348.
564. **Trigonotis rotundifolia** Benth.
Chamnago, Ningbil, 12—14,503 ft., Nos. 3774, 4073.

215. **Onosma** Linn.

565. **Onosma Emodi** Wall.
Changu, Gipmochi, 10—12,000 ft., very common.

LX.—CONVOLVULACEÆ.

216. **Cuscuta** Linn.

566. **Cuscuta reflexa** Roxb.
Karponang, 8,000 ft., No. 4678 *Ribu* !

LXI.—SOLANACEÆ.

217. Solanum Linn.

567. Solanum nigrum Linn.
Phadonchen, 9,000 ft.

218. Mandragora Juss.

568. Mandragora caulescens Juss.
Changu, Chola, Gnatong, 11—12,000 ft., No. 3509. Frequent.

On the west side of the Changu Lake, on the slopes above the road, this plant is fairly plentiful but easily over-looked, as flowers and fruits are very close to the ground. In fact the fruits tend to bury themselves. By the middle of July all the plants are in fruit with rare exceptions. The stems average from 30 to 36 cm., but in the moist basin of the Gnatong Chu I found specimens 60 cm. high with fruit 5 cm. in diameter, and calyx enlarged to nearly 4 cm. long. The stem, leaves, pedicles and calyx are pubescent. Leaves obovate, sometimes narrowly, usually 12 cm. by 5 cm. The measurements given in the "Flora of British India" 11 by 2 in., are surely exceptional or an error. Calyx lobes pubescent and ciliate, green, purplish below, reticulate. Corolla greenish purple, lurid brown inside, with a faint sweet odour, divided and lobed much as the calyx, up to 2 cm. long, rapidly withering when calyx begins to enlarge. Style short thick, just under 1 mm. in length, with bifid dilated stigma. The roots stout, attaining 60—90 cm. in length.

219. Scopolia Jacq.

569. Scopolia lurida Dunal
Laghep, Nathui La, Chamnago, 10—13,000 ft., Nos. 3242, 3794.

LXII.—SCROPHULARINEÆ.

220. Scrophularia Linn.

570. Scrophularia pauciflora Benth.
Changu, 10—13,000 ft. Common.

571. Scrophularia urticæfolia Benth.
Karponang, 8—9,000 ft. Very common.

221. Wightia Wall.

572. Wightia gigantea Wall.
Phadonchen, 6—7,000 ft.

222. Mimulus Linn.

573. Mimulus nepalensis Benth.
Common, 7—10,000 ft.

223. **Mazus** Lour.

574. **Mazus dentatus** Lour.
Laghep, 8—9,000 ft.

224. **Hemiphragma** Wall.

575. **Hemiphragma heterophyllum** Wall.
Common, 7—13,000 ft.

225. **Picrorhiza** Royle

576. **Picrorhiza Kurrooa** Benth.
Common, 12—15,000 ft.

226. **Veronica** Linn.

577. **Veronica himalensis** Don
Changu, Ningbil, 12—13,000 ft., Nos. 3869, 4123. Not uncommon on the Chola range.

578. **Veronica cana** Wall.
Karponang, Changu, 8—12,200 ft. Very common.

579. **Veronica capitata** Benth.
Changu, Chola, 11—14,000 ft., Nos. 3203, 4070. Common.

227. **Euphrasia** Linn.

580. **Euphrasia officinalis** Linn.
Common from 11—13,000 ft.

228. **Pedicularis** Linn.

581. **Pedicularis longiflora** Rudolph
Throughout the Chola range but not common, 12—14,000 ft., Nos. 3660, 4328.

582. **Pedicularis siphonantha** Don
Throughout the Chola range but not common as in north Sikkim, 11—13,000 ft., Nos. 3804, 4247.

VAR. **prostrata** Bonati. var. nov.
Dikchu, 11,000 ft., No. 3827.

"Elle se distingue du type par ses feuilles et lobes calicinaux *plus* découpés, par son port spécial et par sa capsule dépassante a peine le calice, semi-orbiculaire, a pointe déjetée latéralement comme dans le *Pedicularis Souliei.*"

583. **Pedicularis megalantha** Don
Changu, 12,000 ft., No. 4274.

584. **Pedicularis bella** Hook. f.
Lingtu, 12—13,000 ft.

585. **Pedicularis Daltoni** Prain
Dzalep La, Kapoop, 12—13,000 ft., No. 3687 in part.

586. **Pedicularis Garckeana** Prain
Chola, Nathui, Tosa, 13—14,500 ft., Nos. 3687 in part, 4038.

587. **Pedicularis nepalensis** Prain
Changu, 12,000 ft., *King's collector* !

588. **Pedicularis gracilis** Wall.
Lower Chakung, Keadom, 8—9,000 ft., No. 4756 *Ribu* !

589. **Pedicularis porrecta** Wall.
Tanka La, 14—15,000 ft., *King's collector* !

590. **Pedicularis confertiflora** Prain
Kapoop, 13,000 ft., *King's collector* !

591. **Pedicularis flexuosa** Hook. f.
Common on the Chola range, 11—13,500 ft., Nos. 3106, 3135, 3627, 4101, 4121.

592. **Pedicularis sikkimensis** Bonati. sp. nova.

Perennis, pluricaulis. *Rhizoma* repens, elongatum, in internodis additum squamis reliquis a precedentibus annis. *Caules* 10—20 cm. alti simplices, erecti vel flexuosi, paullo foliati, basi glabri, summo pilis fuscis tecti ; *folia inferiora* verticillata, longissime petiolata, petiolis 6—9 cm. basi dilatatis, limbo pingue, 4—5 cm. longo, lineari vel oblongo, pinnatisecto, segmentorum 7—9-jugis ; segmentis pinnatifidis, inferioribus valde distantibus, breve petiolulatis, superioribus sessilibus ac contiguis, obulis integris vel acutidentatis ; *folia caulinaria* ac superiora opposita vel rarissime alterna, breve petiolata, triangulari forma ; petiolis segmentorum inferiorum longioribus ; segmentis aliis generaliter contiguis ac sessilibus. *Bracteæ* foliis superioribus similes petiolatæ, calyce duplo vel triplo longiores. *Flores* axillares, oppositi, pedunculis 2—6 mm. longis. *Calyx* cylindricus, glaber, antice non fissus, 6—7 mm. longus, usque ad tertium fissus in 5 lobis lineato-acutis, subæqualibus, lobo medio integro, lineato-acuto, lateralibus linearibus, basi subfiliformibus, summo dilatatis et acutidentatis. Tubus *corollæ* 20—25 mm. longus, 1 mm. latus, erectus, pubescens ; galea rectangulatim curvata, in parte verticali 4—6 mm. longa, dorso falciformis, 6 mm. longa, 2 mm. lata, attenuata in apicem 2—3 mm. longum, raro horizontalem sæpe parte inferiori galeæ parallelon vel vix divergentem, summo fimbriatum, sicut

in *P. schizorhyncha* Prain; labio inferiore plano, 9 mm. longo, 10 mm. lato, margine glabro ac crenato. *Stamina* tertio superiori tubi inserta, filamentis duobus villosis. *Capsula* 1 cm. longa. *Semina*?

Sikkim, Changu, Chakung-Chu; 13,000 ft., *Smith,* No. 3563, 3849.

"Par ses deux filets velus, sa lèvre glabre et sés sepales incisés, cette plante est trés voisine du *P. flexuosa* Hook. f. Elle se distingue aisément de cette espèce par son rhizôme, la forme de ses feuilles rappelant celles des *P. albiflora* et *P. Gammieana*, par la tube de la corolle relativement *plus* long et *plus* grêle, par son bec *plus* court, laciuié à l'extrèmité et d'une autre direction."

593. **Pedicularis chumbica** Prain

Sherabthang, Chola, 14—14,500 ft., Nos. 3474 *Smith!* 444 *Ribu!*

594. **Pedicularis furfuracea** Wall.

Common on the Chola range, 9—12,000 ft., No. 2995, 3085, 3366, 3725.

595. **Pedicularis Pantlingii** Prain

Karponang, Changu, 9—11,000 ft., Nos. 3133, 3254.

596. **Pedicularis carnosa** Wall.

Lachung Valley, 8—9,000 ft., No. 4737 *Ribu!*

597. **Pedicularis odontophora** Prain

Gnatong, 12,000 ft., *King's collector!*

598. **Pedicularis Wallichii** Bunge

Changu, Kapoop, Tanka La, 13—14,000 ft., Nos. 2137, 3418, 3602.

599. **Pedicularis excelsa** Hook. f.

Ningbil 12—13,000 ft., No. 4160.

600. **Pedicularis lachnoglossa** Hook. f.

Chola, 13—14,000 ft., *King's collector!*

601. **Pedicularis trichoglossa** Hook. f.

Dzalep La, 13—14,000 ft., *Pantling!*

602. **Pedicularis Clarkei** Hook. f.

Changu, 12,000 ft., Nos. 4257, 4371 *Ribu!*

603. **Pedicularis schizorhyncha** Prain ?

Chola, Tanka La, 14,000 ft., 4442 *Ribu!* Fruiting and doubtful.

604. **Pedicularis Regeliana** Prain

Changu, Kapoop, Chola, Tanka La, 12—13,000 ft., Nos. 3863, 3402.

605. Pedicularis Roylei Maxim.

Throughout the Chola range, 12—14,000 ft., Nos. 3477, 3751, 4160.

606. Pedicularis polygaloides Hook. f.

Tanka La, Kapoop 13—14,000 ft., No. 4181.

607. Pedicularis denudata Hook. f.

Dzalep La, Ningbil, Tosa, 13—13,500 ft., Nos. 4059, 4101, 4153.

229. Oreosolen Hook. f.

608. Oreosolen Wattii Hook. f.

Changu, 14,000 ft., No. 4213.

LXIII.—OROBANCHACEÆ.

230. Boschniackia C. A. Mey.

609. Boschniackia himalaica Hook. f. & T.

Changu, Yakla, 11—12,000 ft., No. 3782.

LXIV.—LENTIBULARIEÆ.

231. Utricularia Linn.

610. Utricularia minor Linn.?

Sherabthang, 13,000 ft., No. 3,400. Without flowers, as were Hooker's specimens.

611. Utricularia brachiata Oliver

Karponang, Chola, Ningbil, 8—12,000 ft., Nos. 3029, 4149, 4264.

612. Utricularia orbiculata Wall.

Phadonchen, 7,000 ft., No. 4454.

613. Utricularia multicaulis Oliver

Changu, Chola, 11—13,000 ft., No. 3363.

614. Utricularia furcellata Oliver

Phadonchen, 8,000 ft., No. 4400.

232. Pinguicula Linn.

615. Pinguicula alpina Linn.

Ningbil, 13—14,000 ft., No. 4113.

LXV.—GESNERACEÆ.

233. Aeschynanthus Jack

616. **Aeschynanthus bracteata** Wall.
Dikchu, 8,000 ft., No. 3837.

234. Lysionotus D. Don

617. **Lysionotus serrata** D. Don
Gangtok, Karponang, 4—7,000 ft.

235. Didymocarpus Wall.

618. **Didymocarpus Andersoni** C. B. Clarke
Song, Gangtok, 4—6,000 ft., No. 2936.

619. **Didymocarpus oblonga** Wall.
Above Gangtok, 6—8,000 ft., No. 2954.

620. **Didymocarpus podocarpa** C. B. Clarke
Gangtok, Karponang, 6—8,000 ft., Nos. 2955, 3036.

621. **Didymocarpus leucocalyx** C. B. Clarke
Karponang, 7—8,000 ft., No. 4642 *Ribu* !

622. **Didymocarpus Mortoni** C. B. Clarke
Ari, 5—6,000 ft., No. 4519.

623. **Didymocarpus pulchra** C. B. Clarke
Above Gangtok, 7,000 ft.

236. Didissandra C. B. Clarke

624. **Didissandra lanuginosa** C. B. Clarke
Cheungtong, Chakung Chu. 5—7000 ft., No. 3345

237. Chirita Ham.

625. **Chirita pumila** Don
Karponang, Dikchu, 7—8,000 ft., Nos. 3038 bis. 3825.

626. **Chirita macrophylla** Wall.
Karponang, 7,000 ft., No. 2972.

627. **Chirita Clarkei** Hook. f.
Gangtok, Karponang, 7—8,000 ft., No. 3038.

LXVI.—ACANTHACEÆ.

238. Thunbergia Linn.

628. **Thunbergia lutea** Linn. f.
Phadonchen, 6—7,000 ft.

239. Strobilanthes Bl.

629. Strobilanthes divaricatus T. And.

Phadonchen, 7—9,000 ft.

630. Strobilanthes Wallichii Nees

Phadonchen, Ningbil, 8—11,000 ft., No. 4143.

LXVII.—SELAGINEÆ.

240. Lagotis Gærtn.

631. Lagotis Clarkei Hook. f.

Nathui La, Tosa, Yakla, 14—15,000 ft., Nos. 3457, 3947, 4043, 4097.

As this species was described from imperfect material I add the following notes taken in the field. Rootstock stout, stems up to 15 cm., flexuous, ascending, leafy towards the apex; leaves elliptic-ovate, acute or obtuse, irregularly toothed; spike up to 5 cm; bracts toothed or entire, lower 1·5 cm., upper 6—7 cm.; calyx shorter than the lower bracts, longer than the upper ones, normally 1 cm. long, spathaceous, hooded, enclosing the corolla; nerves reticulate, the two main ones convergent towards apex but not always meeting; the spathe-like calyx is oblong, with one side cut to one half, but with no other indication of lobing, greenish; corolla when open only 2 mm. shorter than calyx, greenish, translucent, oblong, cleft to ¼, 2-lipped, lower lip recurved, broad, rounded, not lobed, upper lip scarcely dilated at the slightly hooded tip; filaments adnate to margins of upper lip; style as long as the stamens; stigma very slightly bifid.

632. Lagotis crassifolia Prain

Tanka La, *Gammie*!

633. Lagotis glauca Gærtn. VAR. **sikkimensis**

Changu, Nathui La, Gnatong, 12—14,000 ft., Nos. 3185, 3241, 4314.

The following notes are taken from my field-book. Rootstock 2—3 cm. thick with numerous fleshy root fibres; stem 36—45 cm. long, suberect, 1 cm. thick, much compressed, naked below the middle; radical leaves numerous, 10—15, large and fleshy, petiole up to 15 cm. long, 10—12 mm. broad; lamina up to 7 cm. long, elliptic-obovate, coarsely toothed subobtuse; cauline leaves narrowly ovate, up to 9 cm. long, 4 cm. broad, remotely dentate, sessile, semi-amplexicaul; nerves slender, translucent, decumbent; spike up to 15 cm.; bracts 1—1·25 cm., ovate, subacute, toothed, slightly longer than the calyx and about equalling the corolla tube, glaucous; calyx a glaucous translucent spathe cleft to the base in front, rounded at the apex where it is slightly erose, even minutely fimbriate, with two non-converging greenish nerves; the corolla lobe and a small part of the tubes protrude from the cleft of the spathe, corolla bluish-white, oblong-tubular, 12—13 mm. long, 2—3 mm. broad, two-lipped; lips 2—3 mm. long, upper if anything slightly longer, ovate, rounded entire apex, lower cleft to the base into linear lobes; the lobes at first whitish, soon fading to a dirty brown in the open flower; anthers with very short filaments in the sinuses between upper and lower lobes; a green gland, larger than the immature ovary on the anterior side of the ovary; stigma capitate, obscurely cleft; style included. The larger specimens seem to me to bridge the gap between this species and *L. spectabilis* Kurz which both Hooker and Prain regard as a doubtfully valid species. See Journ. As. Soc. Beng., lxv, 65.

LXVIII.—VERBENACEÆ.

241. **Verbena** Linn.

634. **Verbena officinalis** Linn.
Temi, Gangtok, 5—6,000 ft.

242. **Premna** Linn.

635. **Premna interrupta** Wall.
Gangtok, Karponang, 5—7,000 ft.

LXIX.—LABIATÆ.

243. **Plectranthus** L'Herit.

636. **Plectranthus macranthus** Hook. f.
Sedongchen, Gangtok, 6—7,000 ft., No. 2953.
637. **Plectranthus scrophularioides** Wall.
Phadonchen, 8—9,000 ft.
638. **Plectranthus repens** Wall.
Keadom, 8,000 ft., No. 4752 *Ribu* !

244. **Elsholtzia** Willd.

639. **Elsholtzia strobilifera** Benth.
Lower Dikchu 7—10,000 ft.

245. **Calamintha** Moench.

640. **Calamintha umbrosa** Benth.
Common, 8—11,000 ft.

246. **Melissa** Linn.

641. **Melissa parviflora** Benth.
Phadonchen, 8—9,000 ft., No. 4435.

247. **Salvia** Linn.

642. **Salvia campanulata** Linn.
Nathui La, Changu, Dikchu, 10—13,000 ft

248. **Nepeta** Linn.

643. **Nepeta lamiopsis** Benth.
Changu, 11—12,000 ft., No. 3644.

249. **Dracocephalum** Linn.

644. **Dracocephalum speciosum** Benth.
Common on the Chola range, 12—14,500 ft., No. 4283.

250. **Brunella** Linn.

645. **Brunella vulgaris** Linn.
Common, 7—1,200 ft.

251. **Phlomis** Linn.

646. **Phlomis macrophylla** Wall.
Changu, Chola, 10—12,000 ft., common

647. **Phlomis setigera** Falc.
Changu, Laghep, 11—13,000 ft., No. 4262.

648. **Phlomis bracteosa** Royle
Changu, Chola, 11—14,000 ft., Nos. 3214, 3738, 4093.

252. **Notochæte** Benth.

649. **Notochæte hamosa** Benth.
Karponang, Phadonchen, 6—8,000 ft.

253. **Eriophyton** Benth.

650. **Eriophyton Wallichianum** Benth.
Ningbil, Tanka La, 14—25,000 ft., No. 4216.

254. **Leucosceptrum** Smith

651. **Leucosceptrum canum** Sm.
Phadonchen, 6—8,000 ft., common.

255. **Ajuga** Linn.

652. **Ajuga lobata** Don
Karponang, 8—9,000 ft.

LXX.—PLANTAGINEÆ.

256. **Plantago** Linn.

653. **Plantago tibetica** H. f. & T.
Gnatong, 13,000 ft., No. 4610.

LXXI.—POLYGONACEÆ.

257. **Polygonum** Linn.

654. **Polygonum delicatulum** Meissn.
Changu, Chamnago, 11—14,000 ft., No 3802. Very common.

655. Polygonum filicaule Wall.

Laghep, Chola, 9—13,000 ft., Nos. 2980, 3389. Very common.

VAR. **villosa**

Sherabthang, Chola, 13—14,000 ft., No. 3478.

VAR. **cæspitosa**

Changu, 12—14,000 ft., No. 3522.

656. Polygonum viviparum Linn.

Chola range, 12—14,000 ft., No. 3629. Common.

657. Polygonum sphærostachyum Meissn.

Changu, Tosa, Kapoop, 12—14,000 ft., No. 3407.

658. Polygonum perpusillum Hook. f.

Chola range, 13—15,000 ft., Nos. 3545, 4044. Common.

659. Polygonum amplexicaule Don VAR. **speciosa**

Laghep, Fieunggong, Gnatong, 10—12,000 ft., Nos. 3882, 4367

660. Polygonum vacciniifolia Wall.

Changu, Chola, 11—1,300 ft., No. 3740.

661. Polygonum flaccidum Meissn. VAR. **hispida**

Phadonchen, 7,000 ft., No. 4448.

662. Polygonum alatum Ham.

Common, 5—10,000 ft.

663. Polygonum runcinatum Ham.

Dikchu Valley, Laghep, 9—11,000 ft.

664. Polygonum sinuatum Royle

Phadonchen, 10,000 ft., No. 4391.

665. Polygonum molle Don

Phadonchen, 8,000 ft.

666. Polygonum polystachyum Wall.

Chola range, 12—13,000 ft., common.

667. Polygonum campanulatum Hook. f.

Chola range, 8—12,000 ft., No. 4366. Common.

668. Polygonum nummularifolium Meissn.

Chola range, 14—15,000 ft., very common.

258. Rheum Linn.

669. Rheum acuminatum H. f. & T.

Changu, Chola, 11—12,000 ft. Common.

670. Rheum nobile H. f. & T.

Changu, Chola, 13—15,000 ft. Not so common as in northern Sikkim.

259. **Oxyria** Hill

671. Oxyria digyna Hill
Changu, 10—13,000 ft.

260. **Rumex** Linn.

672. Rumex nepalensis Spreng.
Karponang, 7—9,000 ft.

LXXII.—ARISTOLOCHIACEÆ.

261. **Aristolochia** Linn.

673. Aristolochia Roxburghiana Koltzsch
Ari, 4—5,000 ft.

LXXIII.—PIPERACEÆ.

262. **Houttuynia** Thunb.

674. Houttuynia cordata Thunb.
Temi, Gangtok, Phadonchen, 5—6,000 ft.

263. **Piper** Linn.

675. Piper nepalense Miq.
Phadonchen, 7,000 ft., Nos. 4470, 4471.

LXXIV.—CHLORANTHACEÆ.

264. **Circæaster** Maxim.

676. Circæaster agrestis Maxim.

Ningbil, 13,000 ft., Nos. 4125, 4503 *Ribu*! Also recorded from the Sebu Valley, 14,000 ft., 1142, *Gammie*!

These are the first records for the East Himalaya. Hooker notes the hooked bristles on the carpels as aids to dispersion, Fl. Brit. Ind. (v, 101). Our specimens were found at a deserted camping-ground; the wandering shepherds and their flocks are no doubt the agents which unconsciously distribute the seeds of this little known plant.

LXXV.—LAURINEÆ.

265. **Beilschmiedia** Nees

677. Beilschmiedia Gammieana King

Phadonchen, Keadom, Lower Chakung Chu, 6—8,000 ft., No. 4757 *Ribu*!

266. **Cinnamomum** Bl.

678. Cinnamomum obtusifolium Nees
Gangtok, Ari, 4—6,000 ft.

267. **Actinodaphne** Nees

679. Actinodaphne sikkimensis Meissn.
Phadonchen, 7—8,000 ft.

268. **Litsæa** Lamk.

680. Litsæa citrata Bl.
Phadonchen, Karponang, 7—8,000 ft.

681. Litsæa sericea Wall.
Karponang, Laghep, 8—10,000 ft., No. 2986.

682. Litsæa elongata Wall.
Phadonchen, 7—8,000 ft.

683. Litsæa salicifolia Roxb.
Song, Ari, 4—5,000 ft.

684. Litsæa oblonga Wall.
Ari, 4—6,000 ft.

269. **Lindera** Thunb.

85. Lindera pulcherrima Benth.
Phadonchen, 8,500 ft.

686. Lindera ? sikkimensis Meissn.
Laghep, 10,000 ft., No. 3284.

This is an imperfectly known species referred doubtfully to *Lindera*. The Laghep specimens have female flowers ; male flowers and fruit still unknown.

LXXVI.—THYMELAEACEÆ.

270. **Daphne** Linn.

687. Daphne cannabina Linn.
Gangtok, Ari, Laghep, 4—10,000 ft.

271. **Edgeworthia** Meissn.

688. Edgeworthia Gardneri Meissn
Phadonchen, 7—8,000 ft.

LXXVII.—ELÆAGNACEÆ.

272. **Hippophae** Linn.

689. Hippophae salicifolia Don
Lachung, Chakung Chu, 9—10,000 ft.

LXXVIII.—SANTALACEÆ.

273. **Pyrularia** Michx.

690. Pyrularia edulis A.DC.
Phadonchen, 6,000 ft.

LXXIX.—EUPHORBIACEÆ.

274. **Euphorbia** Linn.

691. Euphorbia himalayensis Boiss.
Changu, Gnatong, 13,000 ft., Nos. 3161, 4243.
692. Euphorbia sikkimensis Boiss.
Lachung, W. of Tanka La, 8—10,000 ft.

275. **Sarcococca** Lindl.

693. Sarcococca pruniformis Lindl.
Chakung Chu, 8—9,000 ft.

276. **Bridelia** Willd.

694. Bridelia montana Willd.
Ari, 5 6,000 ft.

277. **Glochidion** Forst.

695. Glochidion acuminatum Muell. Arg.
Phadonchen, 7,000 ft.

278. **Croton** Linn.

696. Croton Tiglium Linn.
Ari, 5,000 ft., No. 4517. Probably of recent introduction.

279. **Daphniphyllum** Bl.

697. Daphniphyllum himalayense Muell. Arg.
Samatek, Chakung Chu, 8—9,000 ft.

280. Mallotus Lour.

698. **Mallotus nepalensis** Muell. Arg.
Phadonchen, 7—8,000 ft.

281. Baliospermum Bl.

699. **Baliospermum corymbiferum** Hook. f.
Ari, 5,000 ft, No. 4516.

LXXX.—URTICACEÆ.

282. Laportea Gaud.

700. **Laportea terminalis** Wight
Karponang, 7—8,000 ft.

283. Girardinia Gaud.

701. **Girardinia heterophylla** Dcne.
Phadonchen, 6—7,000 ft.

284. Pilea Lindl.

702. **Pilea ternifolia** Wedd.
Karponang, 8—9,000 ft.
703. **Pilea Symmeria** Wedd.
Common, 8—12,000 ft., Nos. 2987, 3980.
704. **Pilea scripta** Wedd.
Ari, 5—6,000 feet.

285. Lecanthus Wedd.

705. **Lecanthus Wightii** Wedd.
Common, 6—10,000 ft., Nos. 2958, 4397, 4465.

286. Elatostema Forst.

706. **Elatostema subincisum** Wedd.
Laghep, Phadonchen, 7—10,000 ft., Nos. 3382, 4456.
707. **Elatostema Hookerianum** Wedd.
Gangtok, 6,000 ft., No. 2957.
708. **Elatostema surculosum** Wight
Karponang, 8—9,000 feet, No. 3025.
709. **Elatostema obtusum** Wedd.
Laghep, 10,000 ft., No. 3381.

287. **Boehmeria** Jacq.

710. **Boehmeria malabarica** Wedd.
Phadonchen, Ari, 5,000 feet.

711. **Boehmeria platyphylla** Don
Phadonchen, 7—8,000 ft.

288. **Chamabainia** Wight

712. **Chamabainia cuspidata** Wight
Gangtok, 6—7,000 ft., No. 2956.

289. **Pouzolzia** Gaud.

713. **Pouzolzia viminea** Wedd.
Phadonchen, 6--7,000 ft., No. 4447.

290. **Debregeasia** Gaud.

714. **Debregeasia velutina** Gaud.
Phandonchen, 5—6,000 ft.

291. **Parietaria** Tournef.

715. **Parietaria debilis** Forst.
Changu, Chola, 12—13,000 ft., Nos. 3800, 4122, 4225.

LXXXI.—JUGLANDEÆ.

292. **Juglans** Linn.

716. **Juglans regia** Linn.
Phadonchen, 7—9,000 ft.

293. **Engelhardtia** Leschen.

717. **Engelhardtia spicata** Bl.
Phadonchen, 5—6,000 ft.

LXXXII.—CUPULIFERÆ.

294. **Betula** Tourn.

718. **Betula utilis** Don
Chola range, 11—13,000 ft., very common.

295. **Alnus** Gaertn.

719. **Alnus nepalensis** Don
Phadonchen, 7,000 ft.

296. **Quercus** Linn.

720. **Quercus semecarpifolia** Sm.
Dikchu Valley, *Gammie* !

721. **Quercus glauca** Thunb.
Gangtok, 5—6,000 ft.

722. **Quercus lamellosa** Sm.
Phadonchen, 7—8,000 ft.

723. **Quercus fenestrata** Roxb.
Phadonchen, Ari, 6—8,000 ft., No. 4511.

297. **Castanopsis** Spach

724. **Castanopsis Hystrix** A.DC.
Phadonchen, 7—8,000 ft.

725. **Castanopsis tribuloides** A.DC.
Gangtok, Phadonchen, 6—7,000 ft.

298. **Corylus** Linn.

726. **Corylus ferox** Wall.
Dikchu, Cheuntong, No. 4802 *Ribu* !

LXXXIII.—SALICINEÆ.

299. **Salix** Linn.

727. **Salix sikkimensis** Anderss.
Dikchu, Chakung Chu, 11—13,000 ft., Nos. 3755, 3796, 4002.

728. **Salix Daltoniana** Anderss.
Changu, 11—12,000 ft., No. 4597 *Ribu.*

729. **Salix**, sp. aff **Daltoniana** Anderss.
Changu, 13,000 ft. Nos. 3149, 3150.

730. **Salix eriostachya** Wall.
Gnatong, 12,000 ft., No. 4390.

731. **Salix serpyllum** Anderss.
Tosa, 14—15,000 ft., No. 3950.

732. **Salix** sp. near **flabellaris** Anderss.
Changu, 11—12,000 ft., No. 4598 *Ribu* !

733. **Salix Lindleyana** Wall.
Kapoop, Chola, 13—14,000 feet, Nos. 3437, 3698.

734. **Salix calyculata** Hook. f.
Common on the Chola range, 12—14,000 feet, Nos. 3151, 3152, 3219, 3931, 3932.

735. **Salix oreophila** Hook. f.
Changu, Chola, 13—15,000 ft., Nos. 3148, 3464, 3916, 4454.

736. **Salix Thomsoniana** Anderss.
Gnatong, 11,000 feet, *King's collector* !

737. **Salix** sp.
Changu, 11—12,000 ft., No. 4599 *Ribu* !

MONOCOTYLEDONES.

LXXXIV—ORCHIDEÆ.

300. Liparis Richard.

738. **Liparis pygmæa** King & Pantling
Dikchu, 11,000 ft., No. 3769.

301. Tipularia Nutt.

739. **Tipularia Josephi** Reichb. f.
Dikchu 11,000 ft., No. 3828.

302. Dendrobium Schwartz

740. **Dendrobium denudans** Don
Gangtok, 4—6,000 ft., No. 4675 *Ribu* !

303. Bulbophyllum Thouars

741. **Bulbophyllum odoratissimum** Lindl.
Lower Dikchu, Samatek, 7,000 ft., No. 3354.

304. Coelogyne Lindl.

742. **Coelogyne Hookeriana** Lindl.
Lower Dikchu, Samatek, 8—9,000 ft., No. 3359.

305. Calanthe Br

743. Calanthe chloroleuca Lindl.
Lower Dikchu, Samatek, 7—8,000 ft., No. 3352.

306. Listera Br

744. Listera pinetorum Lindl.
Changu, Dikchu, 11—12,000 ft., Nos. 3200, 3759. Very common in the coniferous woods.

745. Listera Lindleyana King & Pantling
W. of Tanka La, 12,000 ft., No. 4720 *Ribu* !

307. Orchis Linn.

746. Orchis Chusua Don
Chola range, 10—12,000 ft., common.

747. Orchis spathulata Reichb. f.
Chola range, 11—13,000 ft., No. 3866. Common.

748. Orchis habenarioides King & Pantling
Changu, Dikchu, 11—12000 ft., No. 3763.

749. Orchis puberula King & Pantling
Dikchu, 10,000 ft., No. 3905.

308. Herminium Linn.

750. Herminium congestum Lindl.
Changu, Laghep, 11—12,000 ft., No. 3198.

751. Herminium orbiculare Hook. f.
Dikchu, Phadonchen, 9—11,000 ft., No. 3757.

309. Habenaria Willd.

752. Habenaria stenantha Hook. f.
Dikchu, 8—9,000 ft., No. 3898.

753. Habenaria oligantha Hook. f.
Laghep, Changu, 10—12,000 ft., No. 3197.

754 Habenaria leptocaulon Hook. f.
Dikchu, Fieunggong, 10—11000 ft., No. 3894.

755. Habenaria nematocaulon Hook. f.
Fieunggong, 12,000 ft., No. 3886.

756. Habenaria Bakeriana King & Pantling
Changu, Dikchu, 10—12,000 ft., Nos. 3503, 3756.

757. **Habenaria Cumminsiana** King & Pantling
Changu, 11,000 ft., No. 4235.
758. **Habenaria albo-marginata** King & Pantling
Changu, Chola, 10—13,000 ft., Nos. 3548, 3637. Common.

310. **Satyrium** Schwartz

759. **Satyrium nepalense** Don
Changu, 11—12,000 ft.

LXXXV.—SCITAMINEÆ.

311. **Roscœa** Smith

760. **Roscœa alpina** Royle
Laghep, Lachung, 10,000 ft., No. 3047.
761. **Roscœa purpurea** Smith
Lachung, 9—10,000 ft., No. 3340.
Not observed in the southern area.

312. **Cautleya** Royle

762. **Cautleya lutea** Royle
Phadonchen, 7,000 ft., No. 4472.
763. **Cautleya robusta** Baker
Gangtok, 6,000 ft.

313. **Hedychium** Kœnig

764. **Hedychium spicatum** Ham. VAR. **acuminatum.**
Phadonchen, 7,000 ft., No. 4469.
765. **Hedychium coccineum** Ham.
Ari, 5,000 ft., No. 4513.

LXXXVI.—HÆMODORACEÆ.

314. **Aletris** Linn.

766. **Aletris nepalensis** Hook. f.
Chola range, 10—14,000 ft., Nos. 3299, 3555. Common.

315. Ophiopogon Ker.

767. Ophiopogon Wallichianus Hook. f.
Gangtok, Karponang, 6—9,000 ft., Nos. 2968, 3035. Very common.

768. Ophiopogon intermedius Don
Changu, 9—10,000 ft.

LXXXVII.—IRIDEÆ.

316. Iris Linn.

769. Iris Clarkei Baker
Laghep, Changu, Dikchu, 10—12,000 ft., No. 3193.
Frequent.

LXXXVIII.—LILIACEÆ.

317. Smilax Linn.

770. Smilax elegans Wall.
Karponang, 9—10,000 ft., No. 3076.

318. Polygonatum Tourn.

771. Polygonatum Hookeri Baker
Laghep, Changu, 12—13,000 ft., Nos. 3295, 3539.

772. Polygonatum verticillatum All.
Common throughout the Chola range, 9—14,000 ft.

773. Polygonatum cirrifolium Royle
Changu, Chola, 12—13,000 ft.

319. Streptopus Michaux

774. Streptopus simplex Don
Changu, Chola, Phadonchen, 8—12,000 ft.

320. Smilacina Desf.

775. Smilacina pallida Royle var. **typica**
Changu, 8—12,000 ft., No. 3102. Very common.
var. **purpurea**
Changu, 9—12,000 ft., Nos. 3108, 3134, 3206.

776. Smilacina oleracea H. f. & T.
Karponang, 8—9,000 ft., very common.

321. Allium Linn.

777. **Allium Wallichii** Kunth
Chamnago, Gnatong, 11—12,000 ft. Nos. 3801, 4373.

778. **Allium victorialis** Linn.
Very common throughout the area, 12—14,000 ft.

322. Lilium Linn.

779. **Lilium giganteum** Wall.
Lachung, Lower Chakung Chu, 9—10,000 ft.

780. **Lilium roseum** Wall.
Dikchu, Lachung, 10—11,000 ft., Nos. 3711, 4545 *Ribu* !

323. Fritillaria Linn.

781. **Fritillaria Stracheyi** Hook. f.
Changu, Gnatong, 9—13,000 ft., Nos. 3097, 3104.

782. **Fritillaria cirrhosa** Don
Changu, W. of Tanka La, 11—12,000 ft., No. 3213.

324. Lloydia Salisb.

783. **Lloydia serotina** Reichb.
Common throughout the area, 12—15,000 ft.
VAR. **sikkimensis minima.**
Changu, Nathui La, 13—14,000 ft., Nos. 3175, 3468.

325. Tofieldia Huds.

784. **Tofieldia himalaica** Baker
Laghep, Dikchu, 10—11,000 ft., Nos. 3048, 3826.

326. Disporum Salisb.

785. **Disporum calcaratum** Don
Karponang, 7—8,000 ft.

327. Clintonia Rafin.

786. **Clintonia alpina** Kunth
Chola, Dikchu, 11—12,000 ft., occasional.

328. Paris Linn.

787. **Paris polyphylla** Smith
Fieunggong, Laghep, 8—10,000 ft.

LXXXIX.—COMMELINACEÆ.

329. Commelina Linn.

788. **Commelina obliqua** Ham.
Gangtok, Phadonchen, 4—7,000 ft.

330. Cyanotis Don

789. **Cyanotis barbata** Don
Phadonchen, 7,000 ft. No. 4457.

331. Streptolirion Edgew.

790. **Streptolirion volubile** Edgew.
Karponang, Phadonchen, 6—9,000 ft., common.

XC.—JUNCACEÆ.

332. Juncus Linn.

791. **Juncus effusus** Linn.
Dikchu, 9—10,000 ft., No. 3822.

792. **Juncus ochraceus** Buchen.
Laghep, Karponang, 7—9,000 ft.

793. **Juncus Grisebachii** Buchen.
Changu, Chola, Gnatong, 12—13,000 ft., Nos. 3704, 4163, 4356.

794. **Juncus chrysocarpus** Buchen.
Chamnago, Yakla, Tosa, 10—13,000 ft., Nos. 3642, 4489 *Ribu* !

795. **Juncus prismatocarpus** Br.
Karponang, Phadonchen, 7—10,000 ft.

796. **Juncus triglumis** Linn.
Changu, Chola, 11—14,000 ft., Nos. 3648, 3853, 3922.

797. **Juncus leucomelas** Royle
Common throughout the area, 10—14,000 ft., Nos. 3063, 3270, 3423, 3752, 3808.

798. **Juncus Thomsoni** Buchen.
Sherabthang, 13,000 ft., No. 4516 *Ribu* !

799. **Juncus leucanthus** Royle
Changu, Chamnago, 12—13,000 ft., Nos. 3155, 3313, 3809.

800. **Juncus** sp. nov ? aff. *J. leucanthi* vel. *J. leucomelanos.*

Stem very slender, tufted, 8—10 cm. high, basal sheaths poorly developed, chestnut brown. Basal leaves very slender, capilliform usually about one half the length of the stem, flexuous, curved ; about the middle of the stem 1—2 capillary bracts resembling the leaves and bearing axillary bulbils. Cyme solitary, 1—2 flowered, 4—5 mm. in diameter. Bracts of the flower equalling the sepals or smaller, sometimes only half the length, ovate-lanceolate, acute or acuminate, brown ; bracts of the bulbils 2—3 times as long, capillary with a broad base. Sepals linear oblong, acute, or subacute, membranous, pale yellow, 3 mm. long ; anthers ½-⅓rd as long as the filaments, exserted ; style long exserted with short stigmas. Capsule obovoid-oblong, cuspidately beaked. Seeds ovoid, scarcely tailed. Bulbils 2—3 mm. long, ovoid, tipped with 1—2 very short capillary leaves.

Sikkim Himalaya, Changu 13,000 ft., No. 3502 *Smith* and without definite place, *King's collector* !

Among Himalayan species appears to come nearest *Juncus leucanthus*, but the solitary flower-head contains one or two flowers only and about 1—2 cm. below the flower appear 1—2 bracts with bulbils. Occasionally the flower at the apex is replaced by bulbils. I cannot consider it a reduced form of either of these two species.

801. Juncus membranaceus Royle

Chamnago, 12,000 ft., No. 3642.

802. Juncus sphacelatus Dcne.

Changu, 12—13,000 ft., No. 4280.

803. Juncus himalensis Klotzsch & Garcke

Very common throughout the area, 10—14,000 ft., Nos. 3075, 3531, 3606, 3857.

804. Juncus sikkimensis Hook. f.

Common on the Chola range, 12—14,500 ft., Nos. 3425, 3851, 4034, 4100.

VAR. **monocephala.**

Changu, 12—13,000 ft., No. 3615.

805. Juncus sp. nov. vel forma minima *J. sikkimensis* Hook. f. VAR. **monocephalæ.**

A slender plant, generally 2—3 cm. high, more rarely attaining 10 cm., densely caespitose but scarcely stoloniferous. Rootstock slender ; stem filiform, base clothed with a few loose sheathes, which tend to split striately into fibres. Leaf solitary or few, terete, filiform, acute, slightly channelled above, equalling or shorter than the stem inserted near the base. Inflorescence of only one flower terminating the stem. Bracts two, filiform, one equalling or a little shorter than the sepals, the other rarely equalling more usually 2—3 times longer than the sepals. Sepals 3 mm. long, patent, glumaceous, linear-lanceolate, black brown. Anthers 2—3 times longer than the filaments equalling or slightly less than the perianth. Style slightly longer than triquetrous ovary, together 5 mm. long, stigmas 3, purplish, slightly longer than the style. Capsule equalling the sepals, ovoid, acute, more or less beaked, dark-brown, shining, 3-septate; seeds few, ½ mm. long, elliptic-ovoid, without tails, chartaceous, minutely rugose ; testa somewhat shiny.

Sikkim Himalaya at an elevation of 12—14,000 ft., Jongri, No. 202 *Gammie*! below Dzalep La, *King's collector*! at Nathui La, Changu Tosa, Chakung, Chu, Nos. 3202, 3465, 3854, 4046 *Smith.*

A very small plant occurring in both west and east Sikkim in the region of heavy rainfall. In structure of flower its affinities are with the variety of *J. sikkimensis* mentioned above but the single flower marks it off from the series in which *J. sikkimensis* is placed. It is a long way from typical *J. sikkimensis* but appears to be connected with the variety *monocephala* by a series of intermediates. The difference is chiefly one of size but is so marked that in my opinion the plant will have to be considered specifically distinct.

806. Juncus Clarkei Buchen.
Chola, Phadonchen, 11—12,000 ft., Nos. 3810, 4419.

333. Luzula DC

807. Luzula effusa Buchen.
Laghep, 11,000 ft., No. 3059.

808. Luzula campestris DC.
Laghep, Changu, Chola, 10—13,000 ft., Nos. 3371, 3646.

XCI.—AROIDEÆ.

334. Arisæma Mart.

809. Arisæma Griffithii Schott
Changu, 10—12,000 ft., No. 3184.

810. Arisæma utile Hook. f.
Changu, 11—12,000 ft.

811. Arisæma speciosum Mart.
Karponang, Phadonchen, 6—9,000 ft., No. 3034.

812. Arisæma Wallichianum Hook. f.
Changu, 11—13,000 ft., No. 3223.

813. Arisæma tortuosum Schott.
Phadonchen, 7—8,000 ft., common.

814. Arisæma consanguineum Schott
Phadonchen, 7—8,000 ft., common.

815. Arisæma concinnum Schott
Phadonchen, 7—9,000 ft.

816. Arisæma Jacquemontii Bl.
Laghep, Changu, Chola, 10—14,000 ft., Nos. 3057, 3595. Very common.

XCII.—ERIOCAULEÆ.

335. Eriocaulon Linn.

817. Eriocaulon alpestre H. f. & T.
Chamnago, 12—13,000 ft., No. 4542 *Ribu* !

XCIII.—CYPERACEÆ.

336. Pycreus Beauv.

818. Pycreus sanguinolentus Nees
Phadonchen, 7—8,000 ft., No. 4402.

337. Fimbristylis Vahl

819. Fimbristylis complanata Link VAR.
Phadonchen, 6—7,000 ft, No 4443.

338. Scirpus Linn.

820. Scirpus caricis Retz.
Chola, 11—12,000 ft., Nos. 3654, 3706.

339. Cobresia Willd.

821. Cobresia schoenoides (C. A. Mey) Steud.
Kapoop, 13,000 ft., No. 3424.

822. Cobresia capiliifolia (Dcne) C. B. Clarke
Dikchu, 13,000 ft., No. 3753. New to Sikkim.

823. Cobresia nepalensis (Nees) Kükenth.
Chakung Chu, Sherabthang, 13—14,000 ft., Nos. 4009, 4515 *Ribu* !

VAR. **elachista** (C. B. Clarke) Kükenth.
Chakung Chu, Changu, 12—13,000 ft., N[illegible]247, 3855.

824. Cobresia seticulmis Boeck.
Changu, Chakung Chu, Tosa, 11—15,000 ft., Nos. 3100, 3959, 3977.

825. Cobresia Hookeri C. B. Clarke
Sherabthang, Tosa, 14,000 ft., Nos. 3449, 4494 *Ribu* !

826. Cobresia uncinoides (Boott) C. B. Clarke
Sherabthang, Yakla, 14—15,000 ft., Nos. 3480, 4562.

827. Cobresia curticeps (C. B. Clarke) Kükenth.
Changu, Chola, Gnatong, 11—12,000 ft., Nos. 3501, 3707, 3975, 4369.

828. Cobresia curvata (Boott) Kükenth.
Changu, 12,000 ft., No. 3506.

340. Carex Linn.

829. Carex nubigena D. Don
Changu, Tosa, 12—14,000 ft., Nos. 3215, 4482 *Ribu* !

830. Carex sp. aff. **nubigena**
Chamnago, 12,000 ft., No. 3655.

831. Carex notha Kunth
Chola, 11—12,000 ft., No. 3727.

832. Carex rara Boott eubsp. **capillacea** Boott
Laghep, Changu, Chola, Yakla, 10—13,000 ft., Nos. 3496, 3647.

833. Carex cruciata Wahl.
Karponang, 6—8,000 ft.

834. Carex filicina Nees var. **meiogyna**
Karponang, Phadonchen, 8—10,000 ft., Nos. 3008, 4383.
Phadonchen, 8—10,000 ft., No. 4403.
var. inter *meiogynam* et *minorem*.

835. Carex decora Boott
Changu, 13,000 ft., No. 3530.

836. Carex munda Boott
Laghep, Changu, Chola, 10—13,000 ft., Nos. 3388, 3495, 3754, 3933.

837. Carex Lehmanni Drej.
Changu, Chola, 11—13,000 ft., No. 4142.

838. Carex obscura Nees
Chola, Tosa, 11—14,000 ft., Nos. 3562, 3642, 3745, 3964.

839. Carex atrata Linn subsp. **pullata** (Boott) Kükenth.
Changu, Kapoop, 12—13,000 ft., Nos. 3154, 3246, 3564.

840. Carex finitima Boott
Karponang, 8—10,000 ft., No. 3009.
841. Carex inanis Kunth
Karponang, 10,000 ft., No. 3044.
842. Carex hæmatostoma Nees
Dzalep, Ningbil, 12—14,000 ft., Nos. 3161, 4148, 4332.
843. Carex setosa Boott
Chamnago, 13,000 ft., No. 3841.

XCIV.—GRAMINEÆ.

341. **Paspalum** Linn.

844. Paspalum sanguinale Lamk.
Phadonchen, 8,000 ft., No. 4396.

342. **Arundinella** Raddi

845. Arundinella villosa Arn. VAR. **himalaica**
Lachung, Chakung Chu, 7—8,000 ft., No. 4738 *Ribu* !

343. **Anthistiria** Linn.

846. Anthistiria Hookeri Griseb.
Chamnago, Keadom, 8—10,000 ft., Nos. 4422 and 4760 *Ribu* !

344. **Hierochloa** Gmel.

847. Hierochloa flexuosa Hook. f.
Changu, Tosa, 10—14,000 ft., Nos. 3101, 3601, 3923.
848. Hierochloa Hookeri C. B. Clarke
Fieunggong, 11,000 ft., No. 3895.

345. **Stipa** Linn.

849. Stipa mongolica Turcz.
Chola, Tosa, 14—15,000 ft., Nos. 3918, 4056.
850. Stipa Orthoraphium Steud.
Laghep, Chola, Gnatong, 11—12,000 ft., Nos. 3967, 4368, 4369 *Ribu* !

346. **Agrostis** Linn.

851. Agrostis canina Linn.
Chamnago, 13,000 ft., No. 3845.

852. **Agrostis micrantha** Steud.
Phadonchen, 8—9,000 ft., Nos. 4420, 4429.

853. **Agrostis Clarkei** Hook. f.
Changu, 11,000 ft, No. 4239.

854. **Agrostis inæquiglumis** Griseb.
Changu, Chola, 11—13,000 ft., Nos. 3972, 4151, 4229.

855. **Agrostis divaricata** Griseb.
Ningbil, 13,000 ft., No. 4561.

347. **Calamagrostis** Adans.

856. **Calamagrostis emodensis** Griseb.
Gnatong, 10—11,000 ft.

857. **Calamagrostis tripilifera** Hook. f.
Changu, 12—13,000 ft., No. 4290.
VAR. **Cumminsii**
Sherabthang, 13,000 ft., No. 4302.

858. **Calamagrostis pilosula** Hook. f. VAR. **alpestris**
Chola, Chakung Chu, 12—14,000 ft., Nos. 3878, 4006.

348. **Deyeuxia** Clar.

859. **Deyeuxia scabrescens** Munro
Common on the Chola range, 12—13,500 ft., Nos. 3875, 4331.

860. **Deyeuxia pulchella** Hook. f.
Yakla, 14,500 ft.

349. **Deschampsia** Beauv.

861. **Deschampsia cæspitosa** Beauv.
Changu, Chola, 11—13,000 ft., No. 3650. Very common.

350. **Avena** Linn.

862. **Avena aspera** Munro
Gnatong, 12,000 ft., No. 4379.
VAR. **parviflora**
Changu, 11—12,000 ft., No. 3497.

863. **Avena subspicata** Clairv.
Chamnago, Ningbil, 12—13,000 ft., No. 4147.

864. **Avena flavescens** Linn.
Sherabthang, Ningbil, 12—13,000 ft., Nos. 4161, 4299.

351. **Danthonia** DC.

865. **Danthonia cachemyriana** Jaub. & Spach.
Laghep, Gnatong, 11—12,000 ft., Nos. 4374, 4554.

352. **Tripogon** Roth.

866. **Tripogon filiformis** Nees
Lachung, 7—8,000 ft., No. 4742 *Ribu* !

353. **Poa** Linn.

867. **Poa pseudo-pratensis** Hook. f.
Changu, Chola, Gnatong, 11—14,000 ft., Nos. 3225, 3779, 3883.
868 **Poa nemoralis** Linn VAR. **ligulata** Stapf
Chamnago, 12,000 ft., No. 3656.
869. **Poa flexuosa** Wahlb.
Common on the Chola range, 11—15,000 ft., No. 3605.
870. **Poa khasiana** Stapf
Chamnago, 11—12,000 ft., No. 3645.
871. **Poa himalayana** Nees
Chakung Chu, Yakla, 11—12,000 ft., Nos. 3965, 3973.
872. **Poa Gammicana** Hook. f. ?
Chamnago, 11—12,000 ft., No. 3793.
873. **Poa** sp.
Chamnago, 12,000 ft., No. 3652.

354. **Glyceria** Br.

874. **Glyceria tonglensis** C. B. Clarke.
Chakung Chu, 11—12,000 ft., No. 3976.

355. **Festuca** Linn.

875. **Festuca valesiaca** Schleich
Changu, 12,000 ft., No. 3499.
876. **Festuca Cumminsii** Stapf
Changu, Chamnago, 12—13,000 ft., Nos. 3844, 4305.
877. **Festuca polycolea** Stapf
Changu, Chola, 13—14,000 ft., Nos. 3460, 3519.
878. **Festuca undata** Stapf VAR. **aristata** ?.
Chamnago, 12,000 ft., No. 3640.
879. **Festuca kashmiriana** Stapf
Ningbil, 14,500 ft., No. 4096.

880. Festuca rubra Linn.
Tosa, 13—14,000 ft., No. 3936.

881. Festuca sp.
Sherabthang, 13,000 ft., No. 4306.

356. Arundinaria Michx.

882. Arundinaria racemosa Munro
Chola Valley, 11—12,000 ft., No. 3723.

883. Arundinaria Falconeri Benth.
Karponang, Laghep, 8—9,000 ft.

GYMNOSPERMÆ.

XCV.—CONIFERÆ.

357. Juniperus Linn.

884. Juniperus Wallichiana H. f. & T.
J. pseudo-sabina F.B.I. nec Fisch. & Mey.
Changu, Laghep, 10—12,000 ft.

358. Abies Juss.

885. Abies Webbiana Lindl.
Changu, Chola, Gnatong, 9—12,000 ft., common.

PTERIDOPHYTA.

XCVI.—POLYPODIACEÆ.

359. Diacalpe Blume

886. Diacalpe fœniculacea C.B. Clarke
Karponang, 8—9,000 ft., No. 3022.

360. Woodsia R. Br.

887. Woodsia lanosa Hook. & Baker
Chamnago, Ningbil, W of Tanka La, 13—15,000 ft., Nos. 3626, 4218, 4555.

888. Woodsia elongata Hook.
Laghep, 11,000 ft., No. 3060.

361. **Peranema** Don

889. **Peranema cyatheoides** Don.
Laghep, 9—10,000 ft.

362. **Hymenophyllum** Linn.

890. **Hymenophyllum exsertum** Wall.
Karponang, 8—9,000 ft., No. 3014.

891. **Hymenophyllum polyanthos** Swartz
Changu, Chakung Chu, 11—12,000 ft., Nos. 3970, 4237.

363. **Davallia** Smith

892. **Davallia immersa** Wall.
Ari, 5—6,000 ft., No. 4518.

893. **Davallia pulchra** Don
Karponang, Chakung Chu, 8—9,000 ft.

364. **Cheilanthes** Schwarz

894. **Cheilanthes farinosa** Kaulf. VAR. **chrysophylla**
Karponang, 8,000 ft., No. 3026.

365. **Cryptogramme** R. Br.

895. **Cryptogramme crispa** R. Br.
Laghep, Kapoop, Ningbil, 12—13,000 ft., Nos. 4105, 4145, 4560.

366. **Pteris** Linn.

896. **Pteris biaurita** Linn.
Phadonchen, 7,000 ft., No. 4462.

367. **Woodwardia** Smith.

897. **Woodwardia radicans** Smith
Chakung Chu, Lachung, 7—9,000 ft., No. 3336.

368. **Asplenium** Linn.

898. **Asplenium alternans** Wall.
Laghep, 10,000 ft., No. 4559.

899. **Asplenium varians** Hook. & Grev. ?
Laghep, 9,000 ft., No. 4563.

900. Asplenium spinulosum Hook. & Baker
Yakla, 12,000 ft., *Atkinson* !

901. Asplenium thelypteroides Michx.
Kapoop, 12,000 ft., No. 3408.

902. Asplenium macrocarpum Hook.
Karponang, 8—9,000 ft , No. 3021.

VAR. **Atkinsoni**
Karponang, 8,000 ft., No. 3027.

903. Asplenium Filix-fœmina Bernh.
Laghep, Yakla, Chakung Chu, 10—13,000 ft., Nos. 8383, 4022.

904. Asplenium (Athyrium) Duthiei Bedd. ?
Changu, Chola, 12—13,000 ft., Nos. 3157, 3610.

369. **Aspidium** Schwartz

905. Aspidium lachenense Hook.
Chamnago, Ningbil. 12—14,000 ft., Nos. 3772, 4082, 4108.

906. Aspidium Atkinsoni C. B. Clarke
Chakung Chu, Yakla, 10—13,000 ft., No. 4557.

907. Aspidium ilicifolium Don
Karponang, Laghep, 8—11,000 ft., Nos. 3020, 4556.

908. Aspidium Prescottianum Wall.
Changu, Chola, 12—13,000 ft., Nos. 3210, 3879, 4268.

370. **Nephrodium** Richd.

909. Nephrodium Filix-Mas Richd. VAR. **parallelograma**
Phadonchen, Yakla, Changu, 8—12,000 ft., No. 4191.

910. Nephrodium odontoloma Hook. & Baker
Laghep, Changu, 11—12,000 ft., Nos. 3156, 4564.

911. Nephrodium Brunonianum Hook.
Changu, Chola, 12—14,000 ft., Nos. 3212, 3622, 4558.

371. **Oleandra** Cav.

912. Oleandra Wallichii Presl.
Phadonchen, 6—7,000 ft., No. 4441.

372. **Polypodium** Linn.

913. Polypodium lachnopus Wall.
Phadonchen, 6—8,000 ft.

914. **Polypodium microrrhizoma** C. B. Clarke
Karponang, 8—9,000 ft., No. 3018.

915. **Polypodium argutum** Wall.
Phadonchen, 7—8,000 ft., No. 4406.

916. **Polypodium lineare** Thunb.
Karponang, 7—8,000 ft.

917. **Polypodium membranaceum** Don
Phadonchen, 6—7,000 ft., No. 4412.

918. **Polypodium cyrtolobum** Sm.
Phadonchen, 7—8,000 ft., No. 4425.

919. **Polypodium malacodon** Hook.
Changu, Phadonchen, 8—12,000 ft., No. 3373.

920. **Polypodium ebenipes** Hook.
Chakung Chu, 8—10,000 ft.

921. **Polypodium Lehmanni** Mett.
Phadonchen, 7—8,000 ft., No. 4407.

922. **Polypodium himalayense** Hook.
Karponang, 8—9,000 ft., No. 3017.

373. **Vittaria** Smith.

923. **Vittaria lineata** Sw.
Phadonchen, 6—10,000 ft., No. 4440.

XCVII.—LYCOPODIACEÆ.

374. **Lycopodium** Linn.

924. **Lycopodium Selago** Linn.
Tosa, 14—15,000 ft., No. 4040.

XCVIII.—SELAGINELLACEÆ.

375. **Selaginella** Spreng.

925. **Selaginella chrysocaulos** Spreng.
Phadonchen, 7—8,000 ft., No. 4401.

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